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The Magazine of New Energy Technology

Cold Fusion • New Energy • Renewable Energy

Volume 7 • Issue 37 • 2001

The Mysteries and MYTHS of HEAT

"Impossible" Thermodynamics Tested and Proved

"...like a bombshell in physics."
Albert Einstein, January 1941

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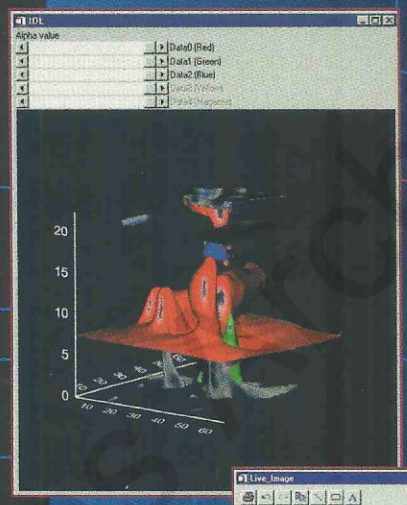

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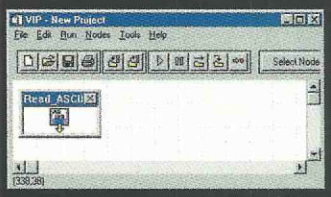

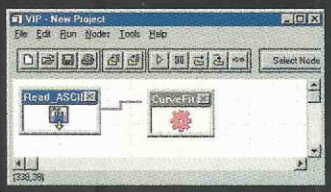

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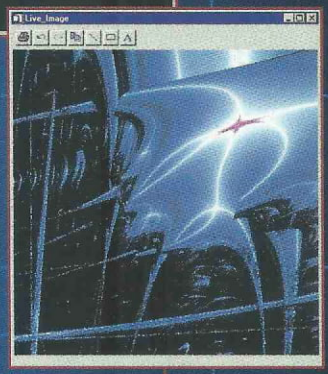

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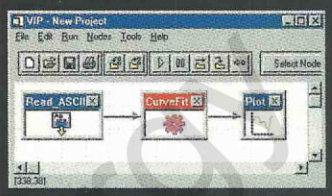

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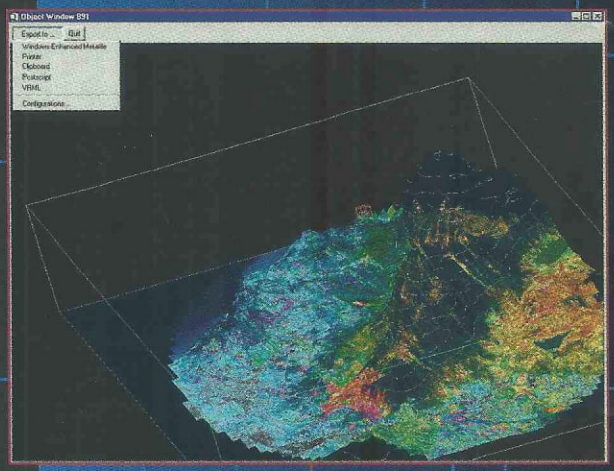

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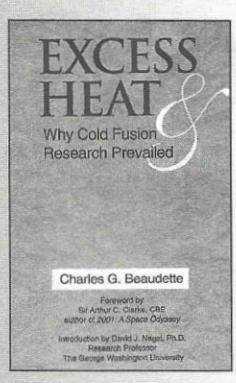

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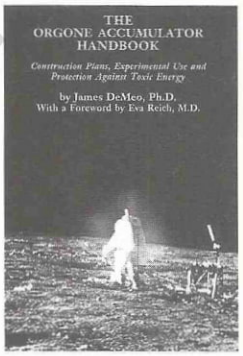

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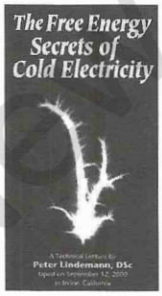

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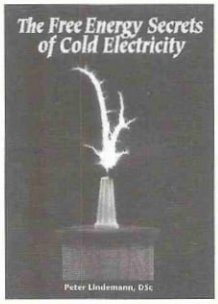
The video is a technical lecture (September 12, 2000) by Dr. Peter Lindemann. A coherent discussion of the possible connections between free energy claims by inventor Edwin Gray in the 1970s-1980s and the much earlier alleged "free" energy broadcasting ideas of Nikola Tesla. Those who experiment and speculate about energies connected with arc discharges and lightning will find in this material highly creative hypotheses.

The book is a wonderful companion to the video. Covers the same material, but goes beyond the video in its publication of text and graphics, making it possible to do detailed study. Appendices include patents by Edwin Grey and Nikola Tesla, as well as two excellent articles by Dr. Lindemann.



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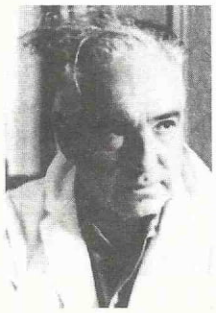
"For sixty years, the Reich-Einstein experiment has remained forbidden territory—unmentioned by conventional physicists, muddled further by the poor experimentation and understanding of Reich's would-be disciples. Not one stringent repetition was ever performed. This alone stands as a tribute to the tortuous slowness of change which the human armor imposes upon human understanding and grasp of natural processes."



Paulo N. Correa and Alexandra N. Correa

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"We have barely begun to reformulate the theory of heat that will extend far beyond the useful but highly limiting concepts we inherited from the nineteenth century."

Eugene Mallove

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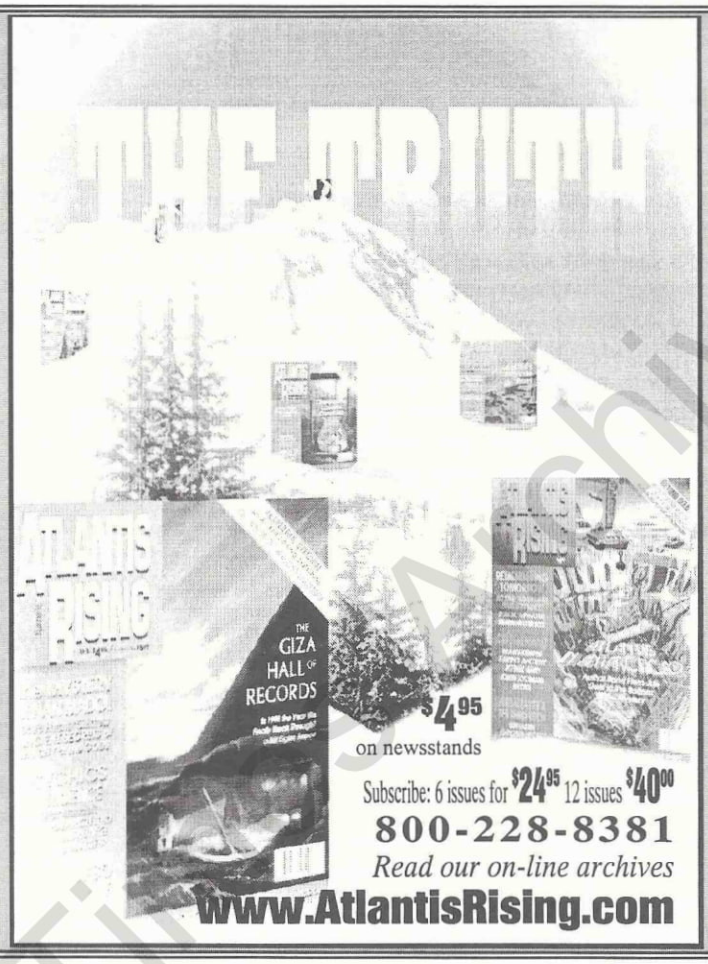

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LETTERS TO THE EDITOR

Start Small

Not being totally immersed in this subject but still very interested, I feel that I have an innocent perspective of the dilemma faced by classically educated experimenters. Our universe seems well-governed by the laws of mathematics, laws that appear to favor nice closed systems, circular if you will. Everything that works well naturally seems to be ball shaped, well, many things anyway, even atoms. It would seem appropriate for a cathode vessel to be as small and round as possible with an unconfined discharge field. Carbon-60 caged around palladium atoms might fit the bill; starting small may be tough but it looks basic. Just wanted to put in my two cents.

Frederick Klock
Berkshire, New York

What's Going On?

The following is an email exchange between *Infinite Energy* subscriber Scot Bruesewitz, of Burlington, Wisconsin, and Editor-in-Chief Eugene Mallove. Dr. Mallove's responses are in italics.

What ever happened to the Patterson power cell?

The folks at CETI say they are working on a better approach right now. They are pursuing a different way, according to my latest information. The old way was not reproducible on demand enough to be of commercial value.

If cold fusion is real, why aren't there any products offered to the public yet?

I'm sorry to make excuses, but it is true that this is not flattering to the field. Money problems, "inventor's disease," attacks on the field, etc. have all contributed to the delay. On the other hand, Dr. Mills seems close to power generation.

It's tiring to hear of meetings and conferences being held, but no progress forward! Where. . .and what can I get my hands on as "Joe Blow Public" to see cold fusion in action?

Believe me, I am as desperate as you are to have this technology work! We are trying our best with limited resources.

Everyone sells out! Convince me. . .

Scot, I hope to convince you when the happy news arrives. It could be sooner than you or I think. Please be patient.

Truth Is On Your Side

Best wishes on a great publication. I like the mix of articles in your fine magazine. The scientific articles are very informative and most impressive from the standpoint of authenticating the reality of this incredible breakthrough. My bottom line for continuing with subscriptions with publications is openness to new phenomena. A second requirement is that the articles have to send me to other reference material. *Infinite Energy* offers both.

I am very impressed by the scientists and their courage in persisting in this undervalued field. I especially enjoyed the book, *Nuclear Transmutation: The Reality of Cold Fusion,* by Tadahiko Mizuno. An excellent and informative read! And I enjoy the videos.

Keep on pushing and researching, because person by person, change is coming and ultimately you will win. Remember, truth is on your side. That in itself is the decisive superiority.

Ron Wilson
Santee, California

Bell Correlation

Those who have been following the Bell correlation experiments (Caroline H. Thompson, "What Really Happens in Bell Correlation Experiments," *IE*, No. 35) may wish to check out the Hydrino Study Group's website (www.hydrino-.org/Assessment.htm), where it is stated that "Mills derives the predicted coincidence rate based on his (Classical Quantum Mechanics) theory" and that "the parameters derived from Mills' theory corresponding to the test by Bell's inequality is consistent with a violation of the inequality which shows that theories with additional intrinsic statistics are invalid."

Charles Stuart
Titusville, Florida

Adding Water Nothing New

After reading the article "Just Add Water" (Bennett Daviss, *IE*, No. 33), I cannot help but wonder why the author of this article didn't give an effective indication as to where the apparent development of a diesel fuel in which a limited amount of water is "attached" to the fuel by one or more detergents "fits" in the somewhat broader field of operating internal combustion engines with a fuel mixture of air, water, and fuel. This is far from being a new topic.

Although most of the prior art on this topic is probably found in the seldom consulted patent literature, a number of articles on this topic have appeared in normal consumer-oriented publications. All of these references make it clear that their objective is to obtain as much "push" out of a given amount of fuel as reasonably possible. Most of the references which I recall are concerned with forming an "intimate" mixture with dispersed water and the fuel prior to the introduction of the mixture into an engine cylinder, but, as I recall, some of the references are not this subtle.

In this connection I have a vague recollection of a tractor which had a valve in a line leading from a water tank to the main fuel line which a farmer was supposed to open when the tractor engine got hot. It seems an almost certainty that there are also references in which water is directly injected into an internal combustion engine cylinder. There are also a number of references in which the air used is saturated with water prior to being carburetored and in which it is also mixed with water within carburetors. It would not be surprising to find various baffles, deflectors, and probably relatively on channels being used to promote and allow time for the through mixture of water and a hydrocarbon fuel and, in some cases, one

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or more additives designed to achieve as complete a dispersion of the water and the fuel as reasonably possible.

Because of the existence of this prior art, wouldn't the "Just Add Water" article have been more meaningful to your readers if it referenced such devices and practices? It seems that at best the Aquazole fuel must be a very specific, limited development in the old field of adding water to the fuel burned in an internal combustion engine.

Ed O'Brian
Portland, Oregon

Bennett Daviss Replies:

As Mr. O'Brian indicates, the subject of suspending water in engine fuel to improve engine performance is not a new topic. In fact, the article does mention that such knowledge dates back to the early days of the twentieth century. In that context, Mr. O'Brian is correct that Elf's Aquazole is another development in that field, although more successful than the majority of known previous efforts.

Had this article been written specifically for *Infinite Energy*, it might have included a more extensive historical review of the failed efforts to create stable emulsions of water and fuel. But, as noted at the beginning of the article, it was originally written for another publication. That publication chose to devote its limited space to the aspects of Johnson's work that *are* new and unique—which is not to create an emulsion of water and fuel or to suspend water in fuel, but to combine the two into a new, stable compound at the molecular level.

Bennett Daviss
Walpole, New Hampshire

On Biological Transmutation of Elements

The following letter exchange appeared in the *Journal of Scientific Exploration* (Volume 7, Number 4, Winter 1993) and is reprinted with permission. We thank *Infinite Energy* subscriber James Mann of Australia for bringing this correspondence to our attention following Dr. Mallove's review of C.L. Kervran's book, *Biological Transmutations* (see *IE*, No. 34).

In a recent column ("The Skeptical Perspective," *JSE*, Vol. 6, No. 4) Epstein presented the item "What's Hot and What's Not," in which he cites Dr. Hearn's remarks concerning Kervran's experimental techniques for the study of claimed transmutation of elements by plants. This points out a major problem: the most well-known sources are not necessarily the most correct or valuable. Kervran's publication of a book in the United States in 1972 and work of his published in France have led to the concept of "biological transmutation" being attributed to him. Unfortunately this may be an example of an interesting phenomenon being rejected on the basis of faulty sources.

It is informative to check Kervran's references to the earlier work of von Herzeele and Baranger. The following information might prove useful in spurring further investigation of this claimed phenomenon.

Between 1875 and 1883 von Herzeele authored a number of articles on inorganic metabolism in plants. While studying the levels of calcium, potassium, phosphorous, and other elements in grains and seedlings of *vicia sativa*, he noticed apparently anomalous variations in the total abundances of these elements in the plants and culture media. Experiments seemed to indicate that the addition of calcium salts or of K_2CO_3 resulted in an anomalous increase in the abundance of phosphorous or calcium beyond the amount expected based on the chemistry.

The seriousness and consistency of these experiments caught the interest of Dr. P.M. Baranger some seventy years later. (Baranger earned a doctorate in physical sciences at the "Pasteur Institute" in 1931 and authored 156 publications during his years as a professor of chemistry at the Polytechnical School.) Experiments were conducted by Baranger and collaborators (Y. Lassale, M. Thoreau, J. Finelli, D. Depond, A Rougeot, Marechal) from 1950 until about 1970. The protocols were very carefully devised and the methods involved state-of-the-art techniques at that time. Data on anomalous changes in calcium and phosphorous concentration began to be reported in 1957 and were published in 1960 and 1961.

The methods used were the following. Seeds of statistically well-known composition were placed in Pyrex glass or polyethylene dishes and soaked with bi-distilled water, with or without a known amount of $MnCl_2$. The levels of mineral traces that could be released from the reagents and apparatus and other measurements were determined with a relative error of approximately 1/1000. Culture dishes were placed in a "phytotron" under controlled conditions. After an interval of about thirty days, plants and culture media were desiccated and subject to analysis using various methods involving appropriate chemical reagents with photometric determination or direct flame spectroscopy. During the entire process the samples were protected against contamination from traces of elements that could have been released by the materials, the reagents, or even the atmosphere in the laboratories. The various apparatus were also systematically controlled.

Hundreds of replications were run with independent batches of 100 seeds of known homogeneity, and as many as ten replications of chemico-physical determinations were done for each case. Statistical distributions were carefully examined and *t*-tests were used to assess the significance of the results.

A statistical study of a series of experiments in 1956 was performed by Cavé (1957). This study found a moderate but significant decrease in potassium ($p < 0.01$) followed by a marked increase in potassium ($t = 8.32$ for 197 degrees of freedom) after germination in the presence of an accurately defined amount of $CaCl_2$. Summarizing the results of all the experiments, seedlings were found to have undergone the following changes in composition after germination and growth: potassium showed a 10% increase in the presence of calcium salts; calcium manifested a 2.5% increase, in distilled water, and a (still significant) 1.5% increase in calcium- containing medium. No significant changes were observed for phosphorous.

Both the French Academy of Sciences and the Academy of Agriculture rejected Baranger's papers. The Academy of Sciences referee's comments criticized the presentation of percentage variation data even though the full data set was available. He also confused biological, chemical, and physical sources of deviation and ignored the statistical studies. The Academy of Agriculture was probably influenced by two experts (both appointed by manure factories) who claimed that they were unable to reproduce Baranger's results on

Letters continued on page 69

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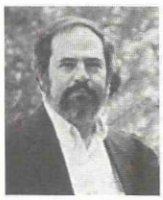
A Bombshell in Science

by Eugene F. Mallove, Sc.D.



In January 1941, Austrian physician Wilhelm Reich, a former associate of Sigmund Freud who was then living in the United States as a refugee from Nazi tyranny, brought to the attention of Albert Einstein a profound thermal anomaly: a significant elevation of temperature (average 0.5°C, peak near 2°C, more in other experiments) above the top of a metal box (a Faraday cage). The temperature was higher than that registered by a freely-suspended thermometer in nearby air. In the course of his researches, Reich had measured this anomaly repeatedly with accurate mercury thermometers. To Einstein's credit, he gave Reich a long audience (over four hours), and later measured and verified the thermal anomaly himself on apparatus provided by Reich within a few weeks.

Unfortunately for Einstein and tragic for the world, on the advice of his assistant Leopold Infeld, Einstein very prematurely dismissed the thermal anomaly as a triviality caused by air currents being shielded by a wooden table. He rejected all further communication from Reich about the experiment. As it turns out, that thermal anomaly is real and important, as many investigators have subsequently found. (In preliminary experiments, with some astonishment, I have observed the phenomenon myself.) And, it is associated with electrical anomalies that are relatively easy to measure with standard gold-foil electroscopes placed in such Faraday cages. Taken together, these anomalies offered dramatic insight into a whole new conception of physics—and most likely much else in science, from astrophysics to biology, medicine, and meteorology—based on the preponderance of evidence I have recently examined from many sources. Einstein had told Reich that if the thermal anomaly was real and significant, it would be like a "bombshell" in physics. He was right about that, albeit the bomb had to wait many decades to go off. It is 2001: The explosion has just begun . . .

Beginning on page 12 we present what I believe to be one of the most important technical papers ever to grace this magazine. Dr. Paulo Correa and Alexandra Correa, whose work with patented, over-unity Pulsed Abnormal Glow Discharge (PAGD™) electricity-generating reactors we have previously covered (beginning with *IE* No. 7 in 1996), have re-examined the thermal anomaly experiment which Wilhelm Reich brought to Albert Einstein in 1941. They have re-done the Reich-Einstein experiment in the most disadvantageous way for Reich (far higher temperature differences—on the order of 10 to 20°C or more—are achievable, they say, by optimizing specially fabricated Faraday cages with multiple layers of dielectric material and steel wool). Still the anomaly persists. They prove conclusively, to the satisfaction of this editor, that this thermal anomaly is real, with extremely high statistical confidence. Others have confirmed this anomaly in working with what Reich called "orgone accumulators" or ORACs, as they have come to be known, but this is the creme-de-la-creme of scientific replications.

Following the Reich-Einstein encounter, World War II played out and we entered the fission nuclear age, a period of obsession by the physics establishment with high energy particle accelerators, thermonuclear weapons, the attempt to control hot fusion, and abstruse "theories of everything" on the path to a unification of physics, a goal Einstein himself had sought but failed to achieve. This is also the period in which Einstein's theory of Special Relativity (SR) has been considered sacrosanct—not open to criticism by anyone but presumed self-deluded, cranky heretics (of which the publishing record shows there are hundreds).

The world also encountered interminable energy crises and wars to protect access to hydrocarbon fuels. (We are in the midst of another such energy crisis, as this is written.) Then came March 23, 1989. On that afternoon in Salt Lake City, Drs. Martin Fleischmann and Stanley Pons brought *another* thermal anomaly to the attention of the world—the elevated temperature of a heavy-water palladium-platinum electrochemical cell, above what it should have been for the electrical input power: a persisting calorimetrically measured excess heat that was later confirmed by many high-quality laboratory results. These were buttressed by irrefutable evidence of nuclear ash from low-energy nuclear reactions. The thermal anomaly was brutally attacked by the scientific establishment as foolish error and incompetence; the nuclear evidence was ignored. The thermal anomaly was rejected on the basis of several low-quality, botched experiments, such as that of the hot fusion laboratory at MIT and the misinterpreted experiments by teams at Caltech and at the U.K.'s Harwell Laboratory. History repeated itself: another premature dismissal of a thermal anomaly, another tragic rush-to-judgment.

The attacks against Fleischmann and Pons rose to very high profile in the press and were witnessed by a much larger audience than those who may have known about Reich's travails. Fleischmann and Pons and the scientists who confirmed their findings suffered very badly for their pioneering work. This new energy source from water—even the *hope* for it, as difficult experiments continued—was denied to the world. Yet Fleischmann and Pons did not have their books burned, as were Reich's in Nazi Germany, in the Soviet Union, and later in the United States in the mid-1950s via the Food and Drug Administration (FDA). This purported arbiter of truth in medicine had arranged by a court-mandated fiat that Reich's claimed biologically interactive, ether-based energy source, which he called "orgone energy" because of its perceived manifestation in certain biological investigations, did not exist. This is precisely what the U.S. Department of Energy (DOE) would do to cold fusion thirty-three years later in 1989. Fleischmann and Pons did not serve time in Lewisburg Penitentiary and die there for their scientific views, as Reich did in 1957. Instead, they and their fellow researchers were subjected to public lynching by the press, egged on by the bigotry of those who claim to be scientists.

In the popular mind, for his purported successful reformulation of basic conceptions of time, space, mass, energy, and gravity, Albert Einstein is ranked as one of the greatest scientists in history. He is the author of the notion of "empty space" or disembodied "spacetime"—a spacetime divorced from energy and mass; he is said to be the destroyer of the physical aether, which all late-nineteenth century physicists agreed had to pervade space in order to explain electromagnetic radiation. Einstein is a "scientific superstar," according to a March 1999 *Time* magazine article (see reprint on the following page). And *Time* named Einstein "Man of the Century." To this organ of misin-

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The century gave us scientific superstars like Freud and Einstein, but it also produced its share of...

CRANKS...

STANLEY PONS AND MARTIN FLEISCHMANN

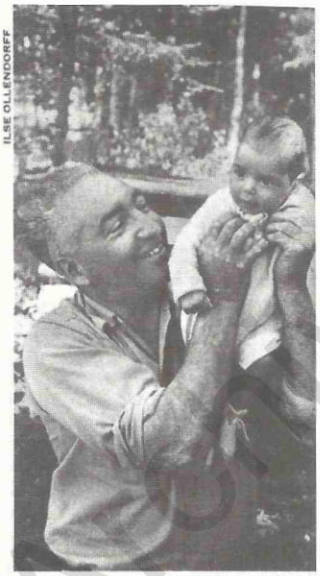
Producing energy through nuclear fusion is easy enough to do—provided you have a reactor that can generate temperatures hotter than the sun's. If you could somehow achieve fusion at room temperature, you'd have an unlimited source of power that could retire petroleum, nuclear and solar energy for good.

In 1989 chemists B. Stanley Pons and Martin Fleischmann announced to great fanfare that they had done just that, building a bench-top fusion percolator made up of two electrodes and a slug of heavy water. But Pons and Fleischmann were vague about how their "cold fusion" reactor worked, and when other scientists tried to duplicate the pair's results, they got mostly cold water for their trouble.

TOM SMART—GAMMA LIAISON

The University of Utah, which held the patent on the process, allowed it to lapse, and cold fusion fell from view. Pons and Fleischmann repaired to Europe to continue their work—separately and quietly.

WILHELM REICH



ILSE OLLENDORFF

Even by his field's indulgent standards, Reich was surely one for the casebooks. Brilliant and charismatic, the Austrian-born psychoanalyst was an early disciple of Freud and produced a shrewd addition to analytic theory: a patient's character, he said, was revealed as much by body language—"muscular armoring," he called it—as by couch talk. Before long Reich split with Freud and went off on his own wobbly path. After dabbling with Marxism, he began theorizing about a universal life-giving "orgone energy"—which, he said, was expressed through neurosis-free orgasms. He fled to the U.S. and soon had followers like Norman Mailer sitting naked in orgone accumulators to achieve "orgastic potency" as well as relief from everything from anxiety to cancer. Meanwhile, Reich's own mental state became increasingly suspect when he blamed UFOs for a deadly counter-energy and said red fascists were out to get him. He died in 1957 while serving a two-year federal prison term for shipping his "dangerous" boxes across state lines.

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formation the discoverers of cold fusion, whose work led to most of the low-energy nuclear reaction discoveries that followed, are mere "cranks." As you can see in the above reprint, *Time* selected them and Wilhelm Reich for special abuse. Adding insult to injury, this half-page of character assassination appears above an indisputable scientific villain and psychopath, the Nazi war criminal, concentration camp medical experimenter "Doctor" Joseph Mengele.

No surprise, the so-called science writers at *Time* did not mention that Reich and others had obtained repeatable physical measurements of temperature, electroscopic, and other anomalies to substantiate what Reich believed to be a pervading cosmic energy that seemed to be linked to life processes. His "orgone energy" bore some apparent relationship to the cosmic aether, which Einstein had supposedly vanquished. Likewise did *Time* in 1999 ignore the thousands of published technical studies supporting cold fusion and low-energy nuclear reactions. These outrages by *Time* will live in infamy.

It is hard to disagree with the Correas: "The experiment on 'spontaneous heat generation' that Reich set up with Albert Einstein on a winter day in the midst of World War II, at the time when Nazi Germany had the upper hand, is likely the most bungled experiment in the history of science." The second most bungled experiment(s) in the history of science are the claimed falsifications of excess heat by the debunkers of Fleischmann and Pons. In both cases, the methodologies of the sick response by a scientific community, which claims to be objective, are quite similar.

The Correas conclude: ". . .Reich is hereby vindicated by this experiment—even under conditions as disadvantageous as those we chose, one can detect a significant and persistent, positive temperature difference that proves the irreducible reality of the thermal anomaly discovered. . .For sixty years, the Reich-Einstein experiment has remained forbidden territory—unmentioned by conventional physicists, muddled further by poor experimentation and understanding of Reich's would-be disciples. Not one stringent repetition was ever performed. This alone stands as a tribute to the tortuous slowness of change which the human armor imposes upon human understanding and grasp of natural processes."

The vaunted Second Law of Thermodynamics is hereby conclusively falsified in at least one phenomenon, the Reich-Einstein thermal anomaly. This should be obvious to those familiar with basic thermal physics. The Correas write: ". . .it is well-established physics that heat can only dissipate—by conduction, radiation, absorption, and re-emission—whereas the observed production of anomalous heat would require that the latter violate entropy and spontaneously accumulate in the outer chamber of the ORAC. Such a notion is not compatible with the electromagnetic notion of passive absorption of black-body theory—since it requires an active drawing of the radiation field that prevents the equalization of temperatures predicated upon thermal diffusion of energy." The Correas summarize what they believe Reich really had discovered: ". . .that thermal radiation flows both entropically and negentropically by a reverse potential, under assignable conditions. . ."

The Correas are firm believers in the *First* Law of Thermodynamics, energy conservation, even within the context of their evolving new physics, some of which—far beyond the content of this article—they have decided to publish in the coming months. (*Infinite Energy* will alert its readers on when and how

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this compendious experimental and theoretical information can be accessed; please monitor our website for immediate notice.) The Correas state in the present paper: "As thermal energy does not arise *ex nihilo,* it must result from the conversion of some other energy, evidently not thermal." They continue: ". . .it is far from ruled out that sensible thermal radiation cannot take subquantic forms—any more than when one considers latent thermal energy to be the intrinsic energy of a molecule, one is necessarily asserting that this energy exists, as such, as a quantic reality of an electromagnetic nature."

In a comment that, if correct, is *certain* to have enormous import on the development of electromagnetic devices that produce free energy, the Correas lay down this gauntlet: "We believe we can demonstrate both formally and experimentally how the blackbody distribution results from the shedding, above all, by electrons, of kinetic energy that was initially absorbed from exposure to an *electrified flux of massfree energy.* [*IE's* italics] The implication here is that electricity exists in two distinct quantum forms, massfree and massbound, and that the former, being in fact radiative, interacts with charged matter to yield that smooth distribution that includes thermal photons."

From this time onward, any theorist who claims to have a comprehensive understanding of electromagnetism, mass, gravity, or thermodynamics had best be able to explain the thermal and electrical anomalies that were initially characterized by Reich, and which will be further elucidated in experiments by the Correas and others. For that matter, any nuclear theorist or solid-state physicist who does not pay attention to the results of the cold fusion and low-energy nuclear reaction field cannot possibly claim a coherent grasp of the real physics of this universe. Those who dogmatically persist with the fiction that Special Relativity and thermodynamics are foundationally sound and closed subjects are doomed. In Einstein's ironic phrase of 1953, they will be "shipwrecked by the laughter of the gods."

It turns out there is more to a comprehensive theory of heat than even the Correa's may have perceived, albeit they have grasped a heretofore unsuspected link with concepts of a non-stationary aether. There are, indeed, "more conventional" thermodynamic anomalies that threaten the Second Law of Thermodynamics, which apparently have little to do with the formulation proposed by either Reich or the Correas. Examples of these can be found in the remarkable papers of Maurizio Vignati (p. 22) and Xu Yelin (p. 31). More such results will continue to appear in the coming years. Xu Yelin in China actually created what may be one of the world's first "perpetual motion machines of the second kind" (PMM2)—a device that produces small amounts of electricity for extended periods of time from a uniform temperature reservoir (ambient temperature). It is not a practical device, but its principle and implication is clear: All is far from well with sacrosanct Thermodynamics. Einstein was catastrophically wrong on this point; witness the quote by him in last issue's "Breaking Through" editorial: "A theory is the more impressive the greater the simplicity of its premises, the more different kinds of things it relates, and the more extended its area of applicability. Therefore, the deep impression which classical thermodynamics made upon me. It is the only physical theory of universal content concerning which I am convinced that, within the framework of the applicability of its concepts, will never be overthrown." Ironically, the theory was overthrown right under his nose and he was blind to the evidence.

But though Special Relativity is wrong and Einstein missed the concept of an energetic, non-stationary aether, he is not to be universally condemned, as the Correas will demonstrate in a paper to be published in the next issue of *Infinite Energy,* "Consequences of the Null Result of the Michelson-Morley Experiment: The Demise of the Stationary Aether, the rise of Special Relativity, and the Heuristic Concept of the Photon." He was a great scientist, a great synthesizer of matters that others had brought to his attention, and he had understandable human failings and limitations. Unfortunately, I believe that the status of dogma to which his theories were held has seriously impeded beneficial technologies.

A parting word to those who still believe in the efficacy of Special Relativity and the fiction of four-dimensional spacetime. A simple experiment using mercury thermometers has proved these notions to be flawed by its demonstration of the presence of an energetic aether. To those who will continue to deny, against all odds, the presence of this energetic plenum of nature: Good luck in trying to escape your quagmire of confusion.

In the next issue of *Infinite Energy* we will begin publishing a comprehensive series of articles by experts, including the Correas, which will reconsider the work of Einstein. We will consider the incorrectly cited experimental underpinnings of Einstein's theories and we will deal with questions about what might replace this now unworkable physics. There is no doubt that new theoretical formulations will be required to explain old and new phenomena that Special Relativity and General Relativity Theory explain incorrectly, if at all.

More exciting will be the arrival, now inevitably, of free-energy technologies that build on the physics of an energetic aether. There is absolutely no doubt in this editor's mind, based on tangible physical evidence and experiment, that an era of free energy and exotic propulsion systems is about to ensue. It will be an age unshackled from the dogmas of the past, whether from Einstein, Rudolf Clausius, Lord Kelvin, Sadi Carnot, or anyone else. Energy will be free and the infinite cosmos will be open to Humankind. Whether humanity has the individual and aggregate wisdom to use these new freedoms wisely as they emerge is a far more difficult and ominous question. Amidst some pessimism based on the sorry record of the past, we'll at least *try* to be optimists! Finally, we promise that in due course, *Infinite Energy* will address the paradigm shift that will be necessary to assimilate an energetic aether into the biological and other sciences, a task which Wilhelm Reich began and which the Correas and others have taken up. These will be exciting times, but we wish they had come much, much earlier.

Source Material on Wilhelm Reich

Many readers will not be aware of the large body of technical work by Wilhelm Reich (1897-1957), as well as commentary by and about him. The two primary sources we recommend are:

• Orgone Biophysical Research Laboratory, Inc., P.O. Box 1148, Ashland, Oregon 97520. (Tel/Fax: 541-552-0118, demeo@mind.net) (www. orgonelab.org). Since 1978, this non-profit science research and educational foundation has been run by James DeMeo, Ph.D., who has conducted numerous experiments in the orgone energy field. His book, *The Orgone Accumulator Handbook,* is an extremely useful introduction. It contains history, philosophy, many practical experiments, and references to original documents. (Now also available from *Infinite Energy,* P.O. Box 2816, Concord, NH 03302-2816, see ad, p. 1.)

• The Wilhelm Reich Museum, P.O. Box 687, Rangeley, Maine 04970. (P:207-864-3443, F: 207-864-5156) (www.tdstelme.net/~wreich), (www.sometel.com/~wreich/). This is an excellent source of primary material, tapes, and books by and about Wilhelm Reich. A large catalog is available. One of the most revealing items, pertinent to discussions in this issue of *Infinite Energy* is "The Einstein Affair," a 96-page, eye-opening compendium of correspondence between Wilhelm Reich, Albert Einstein, and their associates in the 1940s (in both English translations and original German). Published in 1953 by the Orgone Institute Press, it is shocking, poignant and leaves little doubt about what went on in those fateful days.

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THE MYSTERIES AND MYTHS OF HEAT: A BRIEF HISTORY OF HOT AND COLD

by Eugene F. Mallove

It is astonishing to realize that many modern conceptions (or "laws") in the science of heat—thermodynamics—arose during the nineteenth century, a period of utter confusion about the fundamental nature of heat. How could it have been otherwise, given that the very existence of atoms was still in question!

Democritus, Greek philosopher

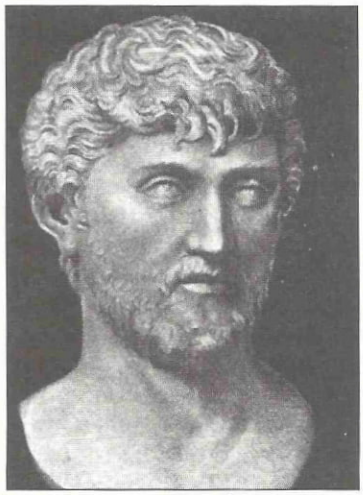
Our knowledge of heat is as old as the history of contemplating whether atoms, "smallest units of matter," exist. Much of what we know—or think we know—about heat came about in the nineteenth century, but thinking about what heat really is goes much further back. Primitive peoples clearly knew that rubbing sticks together could make heat and then fire, but connecting the idea of atoms to this "heat" was beyond even the imaginative ancient Greeks.

A brief perusal of Isaac Asimov's *Biographical Encyclopedia of Science and Technology*[1] unearthed this ancient background of atomic and pre-atomic theory: Greek philosopher Anaximander (610-546 BC) imagined "a formless mass that was both the source and destination of all material things." His name for this unobservable substance was *apeiron*, translation: infinite. Indeed, the precursor of later 19th century theories of the *aether,* and their present emergent forms after their twentieth century Einsteinian demise, traces that far back. It will most likely be determined in the affirmative—after many more bloody battles—that an energetic aether gives rise to matter and is also the repository of its localized extinction. This aether, forming a universe perhaps infinite in time, is nearly certain to vanquish the unsupported myth of Big Bang cosmology.

Another Greek philosopher, Leucippus (born 490 BC), is generally regarded as the primary author of "atomism." Greek philosopher Democritus (440-371 BC), a student of Leucippus, put forth the idea of a void in which atoms moved and interacted. Finally, influenced by this early Greek thinking, atomism was codified and elaborated by Roman writer Lucretius (Titus Lucretius Carus—95-55 BC) in his work "DeRerum Natura"("On the Nature of Things"). Atomism continued to play a role in scientific thinking into the Second Millennium, but since no one had seen atoms or knew their nature, it was possible even for some leading scientists, *e.g.* Ernst Mach (1838-1916), to doubt their existence into the second decade of the twentieth century. With kinetic theory of gases theorist Ludwig Boltzmann listening in January 1897 at the Imperial Academy of Sciences in Vienna, Mach had loudly announced, "I don't believe atoms exist!"[2]

It is fascinating that the first known heat engine (a machine that converts heat to work) was also of ancient Greek vintage—the primitive *aeolipile* of Hero (sometime in the first century AD, about year 75, some think), which used the jet action of steam to produce the rotation of a sphere. In a remarkable example of how an invention can arise and then disappear if it is not manufactured and then used widely, it was not until the seventeenth and eighteenth centuries that heat engines came into being as utilitarian devices, initially to drive crude water pumps. A fascinating story of their development is told by John F. Sandfort in *Heat Engines*.[3] In the process of developing the early heat engines, few people seem to have given much thought to what was this "heat" produced from burning wood or coal. The so-called "father of chemistry," French scientist Antoine Laurent Lavoisier (1743-1794), is perhaps most identified with the invisible fluid concept of heat, which acquired from him the famous name *"caloric."* It was supposed that driving this caloric out of material by rubbing, or by combustion, produced the manifestations of heat—caloric *was* heat. That led to the obvious question: how much caloric could be contained within a given mass of material?

Lavoisier in his *Elementary Treatise on Chemistry* (published posthumously in 1798) listed the then known "elements"—even though the very reality of atoms was still at issue. In that list of elements Lavoisier included, believe it or not, *light and heat!* Now as Asimov remarks, "He had eradicated one imponderable fluid, phlogiston, but it was only partly through his influence that caloric, just as false, remained in existence in the minds of chemists for a half a century." We might add that Lavoisier's dogma of the non-transmutability of "elements"—as he then knew them—has also endured. This two-hundred year-old dogma combined (in the late twentieth and early twenty-first centuries) with modern theories of atomic structure to deny experimental proof of low-energy nuclear reactions. Strong myths and dogmas, once begun, have rather long lives.



Titus Lucretius Carus

The caloric theory of heat was surprisingly enduring. It survived far into the nineteenth century, despite many

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William Thomson (Lord Kelvin)

experiments which showed that caloric, if it existed, had no weight. And there were theorists who founded the kinetic theory of gases, James Clerk Maxwell (1831-1879) and Ludwig Boltzmann (1844-1906), whose theories provided very strong support for atomism. Even the convincing experimental work of Benjamin Thompson (1753-1814), an expatriate from England's American colonies (what are now Massachusetts and New Hampshire) who became Count Rumford in Bavaria, could not kill the idea of caloric. In his work in the late 1790s boring brass cannon barrels for his German patron, Rumford determined that the metallic shavings from this horse-driven boring appeared to have the same heat capacity after the drilling action as before. He suggested that the supply of heat in matter was *without limit*—an exceedingly revolutionary concept that contradicted the caloric theory. He wrote: "The more I meditated on these phaenomena *[sic]*, the more they appeared to me to bid fair to give a farther insight into the hidden nature of Heat; and to enable us to form some reasonable conjectures respecting the existence or non-existence of an igneous fluid: a subject on which the opinions of philosophers have, in all ages, been much divided. . . It is hardly necessary to add that anything which any insulated body, or system of bodies, can continue to furnish without limitation, cannot possibly be a material substance: and it appears to me to be extremely difficult, if not quite impossible, to form any distinct idea of anything capable of being excited or communicated, in the manner the Heat was excited and communicated in these Experiments, except in MOTION." (quoted by J.F. Sandfort[3]).

Today a scientifically literate person understands that the excited, chaotic motion of atoms and molecules creates in our bodies or in measuring instruments a sensation of hot or cold. But this concept of heat is relatively modern—an outgrowth of the work of Rumford and other knowledge developed in the nineteenth century, in particular the work of James Prescott Joule (1818-1889). According to Isaac Asimov, earlier scientists had conceived of heat as a form of motion, among them Francis Bacon (1561-1626), Robert Boyle (1627-1691), and Robert Hooke (1635-1703), but caloric endured, until Maxwell, it is said, finally killed it off.

It is astonishing to realize that many modern conceptions (or "laws") in the science of heat—thermodynamics—arose during the nineteenth century, a period of utter confusion about the fundamental nature of heat. How could it have been otherwise, given that the very existence of atoms was

. . .The Second Law is simply this: A limitation based on the belief that no macroscopic violation of that limitation had ever been seen or would ever be seen.

still in question! One sees the shakiness of the claim that the laws of thermodynamics had reached a state of "near perfection" in the twentieth century (see Von Baeyer[4]), when they in fact rested on this very flawed foundation.

Much before the nineteenth century there was only a very weak conception of a relationship between heat and energy. So it is not surprising that the important paradigm of the conservation of energy, which later became known as the First Law of Thermodynamics, was long in coming. The name firmly associated with introducing the conservation of energy are German physicist Julius Robert Mayer (1814-1878), who predated both James Joule's and Hermann Ludwig Ferdinand von Helmholtz's (1821-1894) statements of the conservation of energy. Mayer in 1842 had published a paper on the general equivalence of all forms of energy and he gave the first estimate of the mechanical equivalent of heat. Because Mayer was not of the scientific establishment, his then heretical concept of the conservation of energy was not accepted. It was James Joule who performed the definitive exhaustive series of experiments that showed the convertability of mechanical action to a heat equivalent. Though Joule began lecturing about and publishing his work in 1843, it was not until a critical meeting at Oxford University on June 27, 1847 at which he lectured that his ideas began to receive acclaim. There, man of the establishment William Thomson (1824-1907), already well-published by his then age twenty-three, became impressed with Joule's solid work on the mechanical equivalent of heat. (William Thomson was knighted as Lord Kelvin in 1866, by which name he is more commonly known.)

But for three years after that meeting there continued a deep confusion in Thomson's mind, based on the earlier work of French engineer Nicolas Léonard Sadi Carnot (1796-1832), with which he was also impressed. Carnot in 1824 (the year Thomson was born) had published a remarkable paper, which mathematically defined the upper limit in efficiency of steam engines of the time—and, by extension, the maximum efficiency of all heat engines. Carnot stated that the most general heat engine required a high temperature input reservoir (at T_{high}) and it had to exhaust its wasted heat to a lower temperature reservoir (at T_{low}). His formulation that the maximum efficiency of a heat engine was $(T_{high}-T_{low})/T_{high}$ later became enshrined as

Nicolas Léonard Sadi Carnot, French engineer

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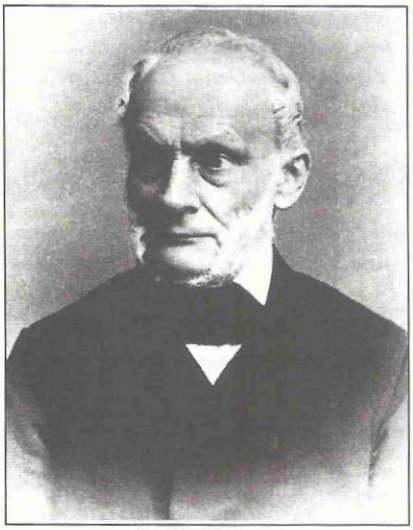
dogma in both physics and in practical engineering. A heat engine that could convert heat to work at 100% efficiency from a single temperature reservoir would be deemed impossible under this Carnot restriction. This is the basis for contemporary mockery of attempts to make what are called "perpetual motion machines of the second kind," of which Xu Yelin's device (see p. 31) is one type.

So what was William Thomson's problem? Thompson in 1847 was still a firm believer in the caloric theory! After all, Carnot had been too, and Thomson firmly believed Carnot—Thompson in fact had rediscovered Carnot's obscure paper and had promoted Carnot's ideas. But Carnot had developed his efficiency limitation on heat engine performance from the perspective of the caloric theory. So here James Joule was presenting in 1847 material that was equally convincing to Kelvin, but energy conservation flew in the face of the caloric theory. Just as Thomson's ideas on resolving the paradox were jelling three years later, German mathematical physicist Rudolf Clausius (1822-1888) published the solution to the paradox in May 1850, "On the Moving force of Heat and the Laws of Heat Which May be Deduced Therefrom."



Rudolf Clausius
German mathematical physicist

In one fell swoop Clausius "scooped" Kelvin and cast into precise form *both* the First and Second Laws of Thermodynamics—energy conservation, and the limitation of Carnot efficiency. The actual form of Clausius' statement of the Second Law is: "It is impossible for a self-acting machine, unaided by an external agency, to convey heat from one body to another at a higher temperature." In 1851, Thomson would claim independent discovery of the Second Law. His statement of it would be: "It is impossible, by means of inanimate material agency, to derive mechanical effect from any portion of matter by cooling it below the temperature of the coldest of the surrounding objects." Both the Clausius and Kelvin statements are said to be equivalent. Clausius' collected thermodynamic theory was published in 1865; it included introducing the seminal concept of entropy, a measure of disorder that, it is said, stays constant or inevitably increases, but never decreases in a closed system.

From that time forward, physics moved in lock-step with the presumed inviolability of the Second Law. It is true enough that the Second Law, in general, mandates that heat cannot *spontaneously* flow from a cold body to a hot body (but be aware, there *may be* exceptions even to this connected with "advanced Maxwell's Demons"). Generations of students had this Second Law and Carnot's maximum efficiency formula "proved" to them by a mathematical demonstration that is nothing short of circular reasoning: *If* Carnot's principle concerning the maximum efficiency of a reversible heat engine were violated in such and such system (elaborately diagrammed in colorful and expensive thermodynamics texts), that would violate the Second Law. Ergo, Carnot's efficiency limit is supposedly proved by *reductio ad absurdum*. The proof is used the other way around too—to prove the Second Law from Carnot! Isaac Asimov, for one, is embarrassingly clear in admitting the circular logic that is implicit: "It is possible from Carnot's equation to deduce what is now called the Second Law of Thermodynamics and Carnot was first to be vouchsafed a glimpse of that great generalization."[1]

Sad to say for the physics establishment and the technology establishment, that turned out not to be the case. For the sake of Humankind, it is very good news indeed that this almost two hundred year old dogma will now come crashing down. As Maurizio Vignati in his exhaustive book[5] and Xu Yelin in his experiments show (and in the work of others still to come no doubt), the Second Law is simply this: *A limitation based on the belief that no macroscopic violation of that limitation had ever been seen or would ever be seen.*

As we will see in the paper Dr. Paulo and Alexandra Correa published in this issue, another much more serious challenge to the Second Law of Thermodynamics has arisen. It appeared in January 1941, as I have outlined in my editorial, when Wilhelm Reich attempted, in vain, to get Einstein to "look through his telescope" to see a persisting temperature anomaly that was in direct violation of the Second Law.[6] Einstein, in effect, refused to "look through that telescope" and we have been suffering delayed awareness of an energetic aether and sound thermodynamics ever since. But now a pathway to a much greater understanding of fundamental physics has opened. We have barely begun to reformulate the theory of heat that will extend far beyond the useful but highly limiting concepts we inherited from the nineteenth century.

Through new physical descriptions of the energetic aether and other emerging understandings of the flaws of classical thermodynamics, all the textbooks will need to be rewritten. If anyone thinks this will be easy, given the behavior of the scientific establishment since the discovery of low-energy nuclear reactions, think again. As with cold fusion, to get the ossified scientific establishment even to listen will require irrefutable devices embodying these principles. It is now certain that these will come.

References

1. Asimov, I. 1982. *Asimov's Biographical Encyclopedia of Science and Technology* (Second revised Edition), Doubleday & Company, Garden City, New York.
2. Lindley, D. 2001. *Boltzmann's Atom: The Great Debate That Launched a Revolution in Physics,* The Free Press, New York.
3. Sandfort, J.F. 1962. *Heat Engines: Thermodynamics in Theory and Practice,* Doubleday & Company, Inc., Garden City, New York.
4. Von Bayer, H.C. 1998. *Maxwell's Demon: Why Warmth Disperses and Time Passes,* Random House, New York.
5. Vignati, M. 1993. *Crisis of a Dogma: Kelvin and Clausius Postulates at the Settling of Accounts,* Astrolabium Associazione Culturale.
6. 1953. *The Einstein Affair.* Orgone Institute Press, Rangeley, Maine, the correspondence between Albert Einstein and Wilhelm Reich, in original German and in English translation.

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Editor's Note: Infinite Energy is honored to be able to publish this landmark article by Dr. Paulo Correa and Alexandra Correa. This year we will also publish two other articles by these authors, which also relate to the work of Albert Einstein and are associated with the physics revealed in the present article. These will be: 1) "Consequences of the Null Result of the Michelson-Morley Experiment: The Demise of the Stationary Aether, the Rise of Special Relativity, and the Heuristic Concept of the Photon" and 2) "The Sagnac and Michelson-Pearson-Gale Experiments: The Tribulations of General Relativity with Respect to Rotation." –EFM

THE REPRODUCIBLE THERMAL ANOMALY OF THE REICH-EINSTEIN EXPERIMENT UNDER LIMIT CONDITIONS

Paulo N. Correa and Alexandra N. Correa*

Abstract

The experiment on "spontaneous heat generation" that Wilhelm Reich set up with Albert Einstein on a winter day in the midst of World War II, at a time when Nazi Germany had the upper hand, is likely the most bungled experiment in the history of science. And it would forever leave hanging over Reich a specter of failure, if not crankness. The man who was later dubbed the greatest genius of the twentieth century by the universal media entente had rejected Reich's discovery of a thermal anomaly as a trivial artifact resulting from the blockage of normal indoor convection currents—the "explanation" having been provided courtesy of Leopold Infeld, then Einstein's assistant.

The experiment centered on whether there was—as Reich claimed—or not, an anomalous positive temperature difference above the top plate of an insulated Faraday cage (named the Orgone Accumulator by Reich). If reproducible, Einstein stated, the thermal anomaly would be "like a bombshell in physics."

This paper describes performance of what we consider to be the critical control to the Reich-Einstein experiment. We found that the positive temperature difference above the top of a naked suspended metal box, as compared to the suspended air thermometer is, in general, sustained around the clock and is highly significant even by statistical analysis. No such thermal anomaly is observed with only a wooden box. Furthermore, we demonstrate how the thermal anomaly can be separated from the cooling effect of any convection currents arising from the ground (or the floor), and persists when the underside of the metal enclosure is directly exposed to these currents. It is therefore a reality independent of any convection currents in a closed room, and specific to the unknown energy functions of a metal box. This simple control would have by itself proven correct the hypothesis that Reich had proposed regarding the existence of anomalous radiative fluxes capable of generating heat in defiance of the Second Law, such as are responsible for the production of an excess thermal energy above the top of the metal box.

For nearly sixty years, the Reich-Einstein experiment has remained forbidden territory: not one stringent repetition was ever performed. This alone could stand as a tribute to the slowness of change, which a socially promoted armor imposes upon human understanding and grasp of natural processes. Yet, the thermal phenomenon is a verifiable reality, observable even under disadvantageous or limit conditions. Thereby, Infeld's objection is shown to be facile, and Einstein's oscillation between his enthusiasm for Reich's explanation and his hasty acceptance of this facile objection leaves us with the sensation that Great Men are only the idols of Little Men. The authors in fact contend that, for a brief moment, Einstein had in his hands the chance he had so much sought (with the gravity papers, the ZPE proposal, and the search for a unified field theory) to grasp an experimental basis for a non-electromagnetic continuous field action.

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Introduction

This report presents conclusive evidence for the claims of Reich regarding the verifiability of the thermal anomaly which he discovered in simple metal boxes, and magnified in special boxes (which he termed Orgone accumulators, or simply ORACs) composed of alternate dielectric and metal layers. In another study due to be published shortly, we focus upon amplification of this thermal anomaly, but in this paper we aim instead at measuring it under limit conditions when, by all accounts, it should disappear. This is what is known as the indoor Reich-Einstein experiment. We found we were able to experimentally verify the thermal anomaly reported by Reich, and we formally demonstrate how it can be analytically and experimentally separated from the effect of convection air currents.

Reich and his memory have been served with an unending stream of epithets that qualify him as a crank and his science as fakery. Persecuted by the FDA (U.S. Food and Drug Administration) for nonlicensed medical use of the ORAC, betrayed by his own counsel, students, friends and relatives, and determined not to recognize any authority of legal courts and licensing bodies to make pronouncements on matters of scientific research and knowledge of nature, Reich stood his ground on the "new physics" of the ORAC, only to endure a jail conviction and to die miserably in the Lewisburg Penitentiary under the most mysterious circumstances. The few who had reticently supported him saw the outcome of the whole process as an expression of some supposed need—on Reich's part—for martyrdom, and they too, turned their backs on him. Aside from the recent New-Age-style mystical "rehab" of vague "Reichian" clichés, Reich's inheritance was neatly defined for posterity by the FDA, the St. Louis National Museum of Medical Quackery where the ORAC still figures prominently, and by such anti-Reich deprecations as those that occasionally originate from FDA-sponsored "science-cop" organizations, such as

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CSICOP (Committee for Scientific Investigation of Claims of the Paranormal).

Yet, despite all the claims of the likes of the Amazing Randi, to this day neither the FDA nor any other public or private institution has moved even a small finger to verify whether or not Reich's claims with respect to the ORAC he invented were true. At the very least, to this day the onus to demonstrate that there is no thermal anomaly lies with the FDA. Yes, a few private individuals have made claims of reproducibility or irreproducibility, but none of these so-called studies have had the substance needed to qualify their results as anything more than anecdotal, either way. The fact is that the authors of the present study do not know of any rigorous reproduction of Reich's findings with the ORAC that deserves reference here, except what Reich himself relates in several of his writings on the subject.[1]

At the core of the controversy stands Reich's claim that he had discovered an unknown kind of energy (Orgone energy, or OR energy for short), which he claimed was neither electric, nor electromagnetic or inertial, and which he could passively concentrate in a specially insulated metal-lined box, the ORAC. He held that the presence of this energy inside these enclosures could be detected by thermal, optical, and electroscopic effects, such that: (1) it caused a spontaneous and sustainable temperature rise within the enclosure; (2) it dramatically slowed down the spontaneous rate of discharge of electroscopes, and (3) it caused different kinds of light phenomena within the enclosure which depended upon the degree of concentration of this non-electric and non-electromagnetic energy.

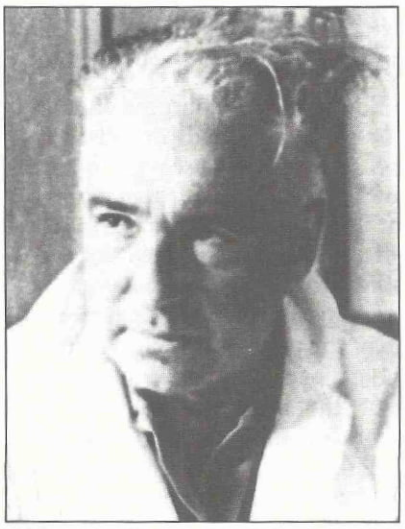
In the present report we endeavor to verify Reich's findings with respect to the thermal effect alone of the naked ORAC, *i.e.* a simple Faraday cage. The reader will see from the present findings that there is no doubt that this cage creates and sustains a spontaneous temperature difference, and hence that Reich's fundamental observation was correct: the thermal "anomaly" he discovered is verifiable. Einstein himself confirmed the existence of the phenomenon and never denied it.[2] All that Einstein did was limit himself, following Infeld's advice, to suggest a trivial explanation for the heat increase that he himself observed, as being due to indoor air convection currents. This is all in the public record[3] even if neither the public nor the scientific community have effectively paid any attention to it. To counteract the trivial Infeld explanation, Reich placed ORACs outdoors in the shade and proved that, in the absence of indoor convection currents, the temperature difference, if anything, augmented, instead of disappearing.[4] Infeld and Einstein never addressed publicly or, as far as is known, privately, Reich's refutation. Note further that, whereas Einstein and Infeld did not deny the existence of a positive temperature difference inside the Faraday cage towards the indoor ambient air temperature, the FDA campaign against Reich consistently denied the existence of such a temperature difference inside the ORAC.

When Reich first addressed Einstein by letter on December 30, 1940, he introduced himself and his problem by stating that he had "discovered a specific biologically effective energy which behaves in many respects differently from all that is known about electromagnetic energy," and that he had done so essentially on the basis of thermometric measurements and scintillation/photographic observations. Einstein answered in his January 6, 1941 letter, that he is "rather willing to talk over your [Reich's] scientific matters with you."

The first meeting took place on January 13, at 16:00 and lasted 4.5 hours. At the second meeting, February 1, 1941, Reich brought a simple ORAC for Einstein to test. Seven days later, Einstein would write the infamous fateful letter confirming the thermal phenomenon but deeming it to be an artifact. By the time the second meeting took place, Einstein had succeeded in placing the reproducibility and interpretation of the thermometric phenomenon as the Litmus test of Reich's discoveries and thought-system.

Essentially the thermal phenomenon or anomaly consisted of the fact discovered by Reich that a thermometer inserted into a dielectric chamber "above an enclosed metallic space" placed indoors at least 1m away from building walls will read a temperature higher by 0.5 to 2.0°C than a control thermometer placed at the same height, but outside the box arrangement.[5] Reich's contention means that the temperature above the top of the cage is consistently greater than that of ambient air. On February 7, Einstein responded with his results and interpretation. He began by confirming the existence of such a temperature difference, and thus verifying the phenomenon—a fact that most remarkably has escaped the attention of all detractors of Reich: "The box-thermometer showed regularly a temperature of about 0.3 to 0.4°C higher than the one suspended freely."[2] Even more astonishingly, Einstein next proceeded to verify also that the phenomenon disappeared when he removed the side and bottom enclosure panels ("Fenster" is the German term he employed) and sat the metal box directly on the table. He wrote: "The temperature difference disappeared or was, in any case, not more than 0.1°C."

So, why then was Einstein not convinced about Reich's claim? Because he now introduces another variable which leads him to conclude that the whole phenomenon is an artifact of air convection currents inside a closed building: as soon as he introduces "some of your [Reich's] folded blue packing paper between the table top and the [bottom of the] box . . .the original effect reappears immediately and regularly," and once again "the temperature at the box becomes 0.3 to 0.4°C higher than that on the freely suspended thermometer."[2] This control fit entirely the objection which Infeld (then Einstein's assistant) had drawn Einstein's attention to—that in a closed room, thermal energy can be transferred by the movement of air molecules from one point to another, thermal convection always moving energy from warm to cool regions of an enclosure. The resulting updrafts of warm air and downdrafts of cool air interact with any horizontal surface placed perpendicularly to these drafts so that the underside of such a surface is cooler "by communicating through convection more with the [cooler] floor, whilst the top side would communicate more with the [warmer] ceiling," to employ the very words of Einstein in the same letter. Then, categorically, Einstein concludes his letter: "Through these experiments I regard the mat-


Wilhelm Reich

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ter as completely solved. The temperature difference has nothing to do with the panels and the metal box, but is solely due to the horizontal table top."

Now, there is no doubt that convection air currents exist inside buildings, nor that there is considerable thermal radiation from all surfaces, particularly horizontal ones. Indeed, the very point of suspending the control air thermometer freely in the room is one continuously missed in attempts to reproduce Reich's original observation of a thermal increase of temperature above the top of an insulated metal box. If such a thermometer is instead suspended over a table top, still at the same height as the experimental thermometers placed inside the box(es), then even in the absence of electric lights in the room there is sufficient thermal radiation being emitted, reflected, and convected from the table top to often nullify the temperature difference of the box(es). This is the trap that beginners run into—when they believe they have at last found the right control, but the control itself is artifactual. But Einstein, under Reich's guidance, did not slip at this stage. Instead, he confirmed the temperature difference with respect to the freely suspended thermometer. However, what Einstein failed to do was precisely what Reich did next—a series of controls, in turn, on Infeld's control. First, Reich duplicated the table top—on which the box sat—with another wooden plate, this time placed above the top of the box, "thus interrupting the hypothetical heat convection from the ceiling down to the table top."[4] This was found not to affect the anomalous temperature difference or its magnitude. Next, Reich replaced the bottom wooden plate by a metal one "which equalizes the temperature difference more quickly"—and again this did not affect the positive temperature difference. Finally, Reich suspended the simple ORAC "freely in the room, without a table top below," and again the positive ΔT value between the outer chamber and the control thermometer remained.

Einstein never responded to these counter-objections and this greatly puzzled Reich. If Einstein had once stated that such a thermal phenomenon would be like a bomb in physics, the trivial solution he now proposed seemed to satisfy his curiosity. For Einstein, as long as the metal box was cooled from below—even indirectly by contact with a horizontal surface that was in turn cooled by convection with the ground, *i.e.* for as long as the box was exposed to the same convection currents as the air thermometer—the thermal anomaly disappeared. Case closed.

In *The Cancer Biopathy* first published in 1947, Reich described the crucial meeting with Einstein in these words:

> The experiment was conducted for the purpose of refuting a specific objection by a distinguished physicist. In January 1941, a few months after the discovery of the remarkable temperature difference, Albert Einstein set up a small orgone accumulator in his home in Princeton, New Jersey. In a subsequent letter to me, he confirmed the existence of a temperature difference at the accumulator, but discovered, in addition, a temperature difference between the underside and the top of the table on which the accumulator stood. This finding naturally undermined the validity of the reading at the accumulator. One of Einstein's assistants, Leopold Infeld, concluded that the temperature difference at the accumulator was to be ascribed to the fact that in the basement room, where the observations were made, there would be an increase in temperature "due to the convection of heat from the ceiling to the table top." However, this assistant failed to check his interpretation of the previously confirmed temperature difference *by simply taking measurements in the open air and in the soil,* where there can be no question of "convection of heat from the ceiling to the table top."

Photo by: Eugene Mallove

The Einstein Memorial at the National Academies, Washington, D.C.

Did Reich's controls of Infeld's control properly address Einstein's objection? Our immediate concern in making this question is with the indoor experiments. Here, with respect to the first of Reich's controls, one could object that a second plate placed above the top of the simple ORAC would limit itself to introducing yet another segmentation on the path of any convection currents—so that there would be a double convection current between ground and the first horizontal surface (the table top), then another double convection current between this surface and the next (in the space where the device is placed), and still another set of currents between the top of the plate and the ceiling of the closed room, with the result that Infeld's objection would still apply. The second control is critical, but not decisive, since Einstein and Infeld could still argue that even though the bottom plate is now metal, it is still insulated from the inner metal core of the ORAC by the insulating bottom panel (Fenster) of the device itself. Finally, the third control performed by Reich came very close to being decisive—but, a meticulous Einstein or a zealous Infeld might still object that the bottom of the suspended ORAC continues to insulate the bottom of the metal box contained inside the ORAC from the cooling effect of any convection currents in communication with the ground or the floor.

What, then, was the simple control that Reich needed to perform? Reich's last control came very close to it. Since essentially the phenomenon first discovered by Reich had to do with the anomalous thermal effect of energy radiation above a metal box, or some certain metal boxes, the decisive control was simply to freely suspend a "naked" or noninsulated metal box—so that the thermometer above its top, being at the same height as the freely suspended air-ther-

. . .We believe we can demonstrate both formally and experimentally how the black-body distribution results from the shedding, above all, by electrons, of kinetic energy that was initially absorbed from exposure to an electrified flux of massfree energy. The implication here is that electricity exists in two distinct quantum forms, massfree and massbound, and that the former, being in fact radiative, interacts with charged matter to yield that smooth distribution that includes thermal photons.

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mometer, would or would not verify whether the thermal anomaly persisted. If it still did, then neither Einstein nor Infeld could have continued to object—for this time, the bottom of the box would have been a good thermal conductor in direct contact with any convection currents that might arise from the ground or floor. Reich's exposition of thermic orgonometry in *The Cancer Biopathy* is not amongst his clearest—yet, it begins precisely by building a one cubic foot metal box, which he already calls an Orgone Accumulator,[6] and measuring the temperature in a well-insulated cylinder above this simple metal box against the temperature of the air in the room. To satisfy the entirety of the argument developed by Einstein and Infeld, Reich only had to suspend this very contraption—strictly speaking, this Faraday cage—and demonstrate thermally the presence of some radiation emanating from its top. That was the discovery, and nothing more. And that, also, was the core of what we have termed the Reich-Einstein experiment.

We begin, therefore, with a reproduction of this experiment, comparing the results obtained indoors precisely with a suspended metal box, against a suspended control thermometer, as well as against a metal box and a simple ORAC like the one that Reich loaned to Einstein, placed upon individual stands. This eliminates entirely the problem of table tops, and compares a metal box that is freely suspended, and thus subject to convection currents on its underside, to one which is isolated from the ground, and thus isolated from convection currents on its underside, by an individual stand. [*Editor's Note:* The cross-section of the cardboard stand is the same size and shape as the base of the box.] With this approach we succeeded in separating the thermal anomaly from the effects of any convection currents in a closed, basement laboratory room.

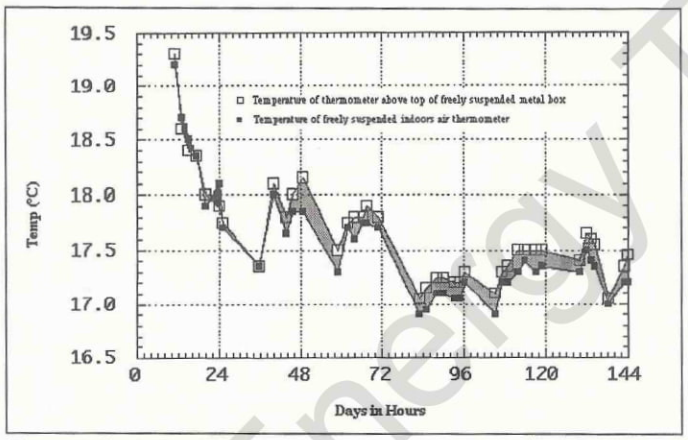

Figure 1. Control and experimental indoor temperature curves for a simple suspended Faraday cage.

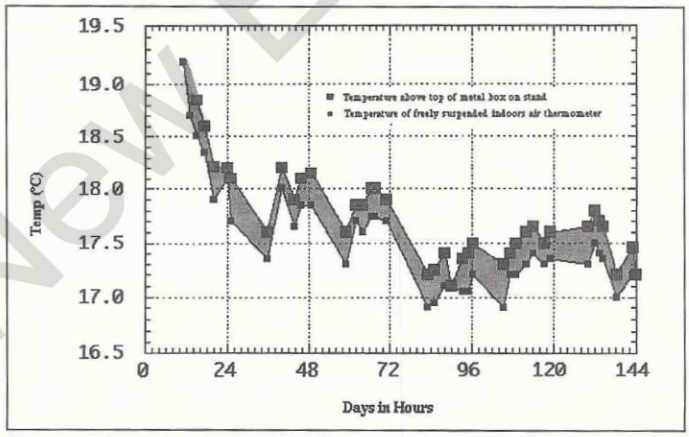

Figure 2. Control and experimental indoor temperature curves for a simple Faraday cage on a table stand.

Results

To reproduce the Reich-Einstein experiment with the adequate control that we have just described above, we built three identical galvanized iron metal boxes, suspended one, mounted the other on a stand, encased the last within a specially designed wooden box, to form a simple ORAC, and mounted this last contraption also on an identical stand. This simple (or single layer, 1x) ORAC reproduces the simple 1x ORAC that Reich lent to Einstein in 1941. It consisted of a 10" x 10" x 10" wooden box that fit over a galvanized iron metal box, into which was inserted (from the top) a mercury thermometer, having its bulb 2 to 4 cm away from the top of the metal inner chamber. When the wooden box and the metal box were taken apart, each could be tested separately—it is in this sense that in his February 6, 1941 letter to Einstein, Reich reports that, by itself, each box developed a minor or no positive temperature difference towards ambient air, but when put together, they maintained a consistent difference of 0.5 to 1.1°C.

So we constructed two identical pine boxes (10" x 10"x 10", 0.5" thick) with a removable bottom and painted them with shellac, and three 27-gauge pulled galvanized iron metal boxes (8" x 8" x 8") having a swinging bottom. We next assembled one of the metal boxes inside one of the wooden boxes, to reproduce the simple ORAC arrangement that Reich loaned to Einstein, and kept the other two boxes, one of metal and the other of wood, as controls, suspended and mounted. At the height of 3 cm above the top of each metal box, we placed a thermometer inside a PVC pipe insulated on top by mineral fiber, with an unimpeded space all around the thermometer bulb (as per Reich's indications). All thermometers were identical -10 to +50°C calibrated mercury thermometers with a resolution of 0.05°C. They were all calibrated at three different temperatures in a shaker waterbath and proved to read within 0.05°C of one another, and within 0.025°C of their means at different temperatures. Subsequently, they were randomly distributed between the devices.

To make the test conditions as disadvantageous as possible towards proving Reich's contention, while keeping to strict verification and controlled repetition, we conducted the experiment indoors, during the winter, in a very large basement laboratory room that was not heated (hence the cool ambient temperatures that we registered), but had all four walls isolated from the ground and the outside air by other inner walls leading to cold rooms. All doors were kept shut around the clock and significant air leaks plugged. All the devices were placed at the same height, half-way between the ground floor and the ceiling, such that all thermometers were also at the

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same height. The devices were placed (one suspended, the other two on individual stands formed by solid cardboard boxes) in a triangle around the control room thermometer, at >2 feet of distance from each other and from the control thermometer which was also freely suspended at the same height. We would expect that, if Infeld and Einstein were correct, we might see a positive temperature difference in the two devices that are mounted on individual stands, since the stands will block any convection currents that might cool the boxes from below; but we should not see any significant difference between the temperature of the metal box that is freely suspended and the temperature of the freely suspended thermometer, since the suspended metal box is directly exposed to cooling by communicating with the cooler convection currents that rise from the ground. Conversely, if Reich were correct, we should see a positive difference in all three box thermometers, because the phenomenon—the thermal anomaly in question—is not caused by convection currents, or their unbalance, but by radiative property of metals with respect to an energy that is not *per se* the same as thermal energy, but which, by reflecting from metal surfaces, converts into heat.

The results shown in Figure 1 are for a 6-day sample of a continuously running experiment, in the winter month of February, comparing the temperature of the thermometer 3 cm above the top of the suspended metal box with an identical indoor air thermometer suspended freely at the same height 2 feet away. The first obvious feature of this figure is the parallel diurnal pattern of the two curves which, with the exception of the first 24 hours, display a cyclic rise from midday onwards, and a steady fall through the evening, night and early morning. The experiment begins as a severe snowstorm is in progress outside, and this is immediately reflected in the null or even negative temperature difference observed for the first day of the experiment. For the next three days (24 to 96 hours), however, the weather was bright, clear and cold—and the temperature difference now becomes solidly positive, remaining so even through the cloud covered period of the fifth day (96 to 120 hours), and the second snowfall of day six is responsible for the midday temperature fall at ca 132 hours. Despite the null and even negative values registered, a paired Student t-test indicates that the mean difference of 0.12°C±SEM0.016 (max: 0.3°C) is highly significant, with $t = 7.699$, $p<0.0001$ and $df = 39 = n-1$. This is indeed a much smaller difference than that claimed by Reich and corroborated by Einstein, but an irreducible one nevertheless that proves the reality of the anomaly, since it is observed even when the underside of the box is directly exposed to any convection currents that, arising from the ground, could cool the metal box. Einstein failed, therefore, to perform the critical control, and so did Reich, who came very close to doing so when he suspended a simple ORAC, instead of the metal box itself. But Reich is hereby vindicated by this experiment; even under conditions as disadvantageous as those we chose, one can detect a significant and persistent, positive temperature difference that proves the irreducible reality of the thermal anomaly that he discovered.

The results obtained simultaneously with an identical metal box whose underside was protected from communicating with any convection currents rising from the ground are presented in Figure 2. Here, one can graphically see how the difference between the temperature above the top of the metal box on the stand and the temperature of the indoor air thermometer has now increased, in fact by more than two-fold, and is always positive. The mean difference of 0.257°C±SEM0.015 (max: 0.4°C), was also evaluated by a paired Student t-test as highly significant, with $t = 17.822$, $p<0.001$, and $df = 36$. A still greater positive difference was generally registered for the same time period by the thermometer above the top metal plate of the simple ORAC also placed on an identical individual stand, and this is shown in Figure 3. For the outer chamber of the simple ORAC, the mean difference recorded was 0.283°C±SEM0.019 (max: 0.5 °C), and a similar paired Student t-test also rejected the null hypothesis, with $t = 15.432$, $p<0.0001$ and $df = 39$.

The curves for $\Delta T = T_{atopbox} - T_{control}$, which Reich specifically designated as T_0-T, for each of the three boxes tested are shown in Figures 4-6: ΔT_1 for the suspended simple cage in Figure 4, ΔT_2 for the simple cage on a stand in Figure 5, and ΔT_3 for the simple ORAC on a stand in Figure 6. All three curves document the consistently positive temperature difference that serves as signature to the thermal anomaly observable above certain metal boxes and which Reich discovered. Instances when ΔT is negative do occur, but they are by far and large exceptional situations, caused either by rapid warming of the local environment (whose effect lags inside even simple ORACs) or are coincident with severe weather systems. Despite these occasional null or negative values of ΔT, statistical analysis demonstrates that all three ΔT values and curves present highly significant differences.

Figure 7 compares the ΔT values obtained for the two metal boxes, one suspended freely and the other on the stand. The darkest grey areas represent negative values of ΔT, the intermediate grey areas represent the instances where both boxes give positive ΔT values, and the lighter grey areas the positive ΔT

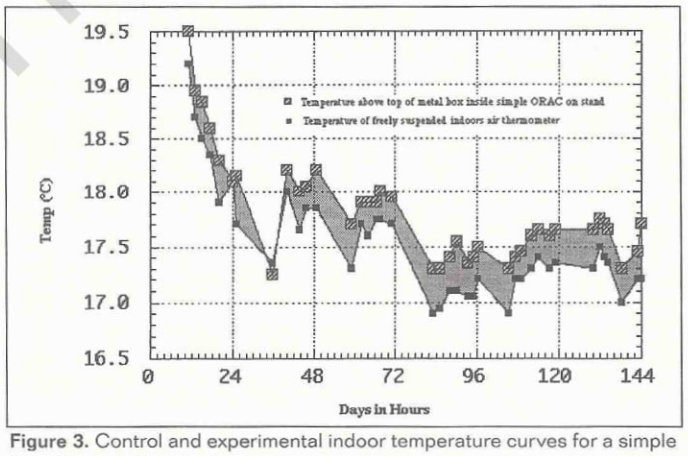

Figure 3. Control and experimental indoor temperature curves for a simple ORAC on a table stand.

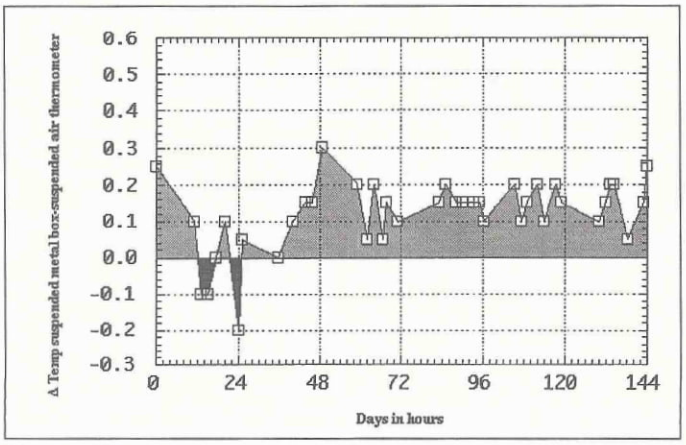

Figure 4. ΔT_1 values for suspended Faraday cage.

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values registered only by the standing metal box thermometer, in excess of the positive ΔT values for the suspended metal box thermometer. A paired Student t-test for the two metal boxes gives their difference also as highly significant, with the mean difference between them being 0.134°C±SEM0.02 (max: 0.418°C), and $t = 6.743$, $p<0.0001$, $df = 36$. The difference in temperature between the thermometers placed above the two metal boxes (*i.e.* ΔT_2-ΔT_1) is shown in Figure 8, and indicates the full breadth of the thermal phenomenon Reich discovered, under stringent conditions, since it now excludes any cooling of the metal box from below, which does in fact (but for one negative reading) obscure the phenomenon by the variable amount shown in that figure. Finally, the addition of the wooden panels to form a simple ORAC adds to the naked metal box a marginal increase in temperature above its top plate (0.032°C±SEM0.022, with max: 0.425°C), and the difference between the temperature above the top of the simple ORAC and that above the top of the metal box on the stand (*i.e.* ΔT_3-ΔT_2) is shown graphically in Figure 9. An evaluation by the paired Student t-test accepts the null hypothesis at $p<0.05$, since the t value is 1.462 ($df = 36$), putting $p<0.152$ as condition for its rejection. We conclude, as Reich did in later years, that wood panels are poor absorbers of the ambient energy responsible for the observed thermal anomaly.

Discussion

These simple results unequivocally demonstrate the correctness of Reich's observation regarding the existence of a thermal anomaly above certain metal enclosures, and formally as well as experimentally disprove the objections and interpretation put forth by Infeld and hastily accepted by Einstein. Furthermore, we demonstrate how the thermal anomaly can be separated from the cooling effect of any convection currents arising from the ground or the floor, and persists when the underside of the metal enclosure is directly exposed to these currents. Since Reich tried so many experimental variations on his measurements of this thermal anomaly with ORACs (going as far as responding to Einstein's letter with a twenty-six page letter replete with other experimental observations that served as evidence for his theory of a more fundamental kind of energy), he might well have been excused for not having performed what we have called the critical control experiment, particularly when he came so very close to it. Yet, these authors firmly believe that such an experiment was all that Reich needed in order to have properly countered the Infeld objections that Einstein later adopted. The Reich-Einstein experiment remained therefore inconclusive and incomplete—as if for all time condemned to a permanent state of suspension, with its terms of reference forever muddled.

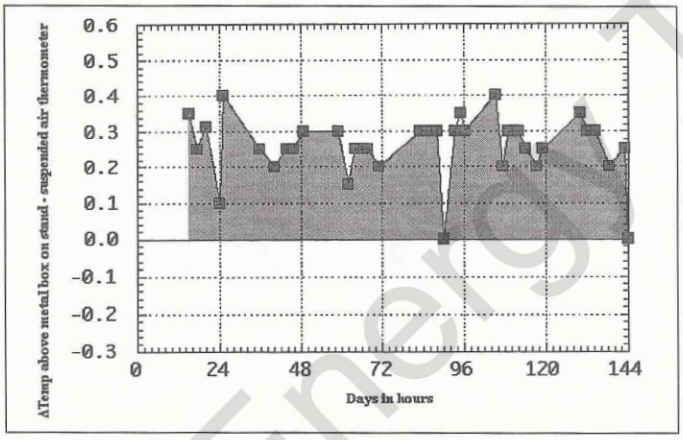

Figure 5. ΔT_2 values for Faraday cage on a table stand.

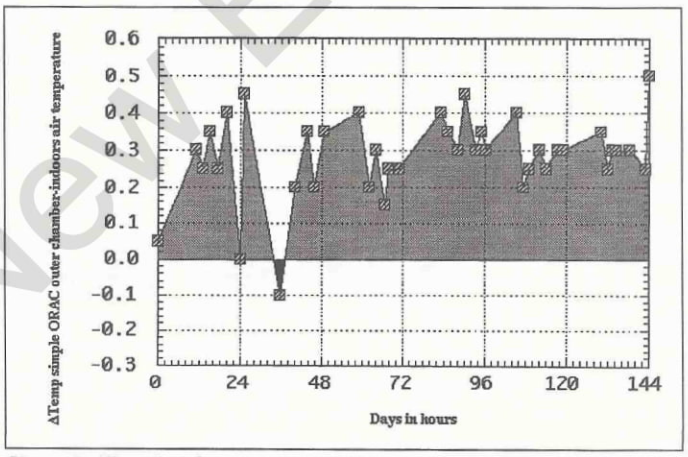

Figure 6. ΔT_3 values for a simple ORAC on a table stand.

The experiment that Reich set up with Einstein on that February day in the midst of World War II is in all probability the most bungled experiment in the history of science. It would forever leave hanging over Reich the specter of failure, if not crankness. The man who was later dubbed the greatest genius of the twentieth century by the universal media entente, had rejected Reich's discovery of a thermal anomaly as a trivial artifact resulting from the blockage of normal indoor convection currents. And the only reason why Einstein had deigned to talk to the most eminent pupil of Freud, and pursue the matter at all, had been because he had "bitten" Reich's words which ventured that orgone energy research might possibly "be used in the fight against the Fascist pestilence." Thus, the official chronicler of Einstein, Ronald Clark, wrote in his biography: "Einstein, who had encouraged the country forward in what still seemed to be one in a million chance of using nuclear fission for this very purpose, was the last man to resist such a bait"[7]—only to conclude that "Einstein found a commonplace explanation of the phenomena which Reich had noted." The totally unwarranted plural "phenomena" is employed here to dismiss the entirety of Reich's findings which he had reported to Einstein, as if Einstein could, with the wave of his hand, equally dismiss all the other anomalous phenomena Reich had unearthed. Further, to be loyal to the record, what was at stake in Einstein's own view was not *phenomena,* but the *phenomenon* of a thermal anomaly, for which not Einstein but Infeld, had "found" a trivial explanation. Never mind the small lapse on the part of a great mind in having overlooked the obvious commonplace explanation (later supplied by Infeld) when Reich visited him at Mercer Street on January 13, 1941. It might well not have been the most intelligent move on Reich's part to unveil all of his discoveries at once and thereby cause them to hinge upon verification of a thermal anomaly which clearly required more careful observation and experimentation than the man who was officially sanctioned as the brightest of the twentieth century had been willing to dedicate. But there it was: all of Reich's discoveries seemingly pivoting upon one experimental proof.

For sixty years, the Reich-Einstein experiment has remained forbidden territory—unmentioned by conven-

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tional physicists, muddled further by the poor experimentation and understanding of Reich's would-be disciples. Not one stringent repetition was ever performed. This alone stands as a tribute to the tortuous slowness of change which the human armor imposes upon human understanding and grasp of natural processes. Yet, the thermal phenomenon is a verifiable reality, observable even under disadvantageous conditions. Therefore, Infeld's objection is shown to be a facile one, and Einstein's oscillation between accepting Reich's explanation and hastily accepting a facile objection, leaves us with a curious measure of the extent to which Great Men are only the idols of Little Men.

We have performed what we consider to be the critical control to the Reich-Einstein experiment and, as the reader can see, the positive difference between the temperature atop a naked suspended metal box and the control temperature of a suspended air thermometer is in general sustained around the clock and is highly significant by statistical analysis. Furthermore, the same thermal anomaly is not observed with a wooden box (results not shown)—where, to quote Reich, "the temperature above the wooden box [control] is the same as within."[8] The thermal anomaly is therefore a reality independent of any convection currents in a closed room and is specific to the energetic functions of a metal box. This alone would have proven correct the hypothesis that Reich had proposed regarding the existence of anomalous radiation which does not obey the Second Law, and is responsible for the production of an excess thermal energy above the top of the metal box. But very much wanting to connect this radiation with the electrostatic phenomena of dielectrics, he appeared to make the phenomenon entirely dependent upon a certain arrangement of dielectric and metal materials ("The demonstration of such irregularities in the equalization of temperature succeeds only if one imitates, in miniature, the arrangement of materials of a planet such as our earth. Then one finds indeed *a constant temperature difference without a constant source of heat of any known kind.*"[9]), whereas the phenomenon such as we have reproduced it and such as he and Einstein verified it, referred directly to the performance of the metal box, specifically to the production of heat above its upper surface, a phenomenon which the addition of the dielectric (or the arrangement of the materials) limited itself to further amplifying.

Is Orgone Energy the Same as Thermal Energy?

The question that then arises is whether the radiation responsible for this thermal anomaly is thermal radiation or not. Reich himself wavered in his reasoning, suggesting that his choice of emplacement of the thermometer was predicated on a flux of thermal energy that, to pick an argument, could just as well have been a convective flux as a radiative one, or for that matter a conductive one—as when he writes that "since heat rises, the most favorable spot for temperature change to be registered is above the top metal plate" of an ORAC.[6] Yet, his approach to Einstein was predicated on the wider discovery (the "phenomena") of a non-electromagnetic form of energy radiation—and, moreover, in the paragraphs preceding this quote, Reich had just introduced his reader to the notion that this energy is radiated, as well as reflected, by the surface of a metallic box, and that when the motion of this radiated and reflected energy is blocked, it gives rise to a local increase in temperature. In the same presentation, Reich also entirely glosses over the thermometric measurement of the inner chamber of the ORAC, *i.e.* the measurement of the temperature inside the metal box of the ORAC. In a separate writing entitled *The Orgone Energy Accumulator* published in 1951, the only reference he makes to the performance of the inner chamber of a simple ORAC is in the following passage: "The temperature, as compared with room temperature, is highest *above the upper metal plate, slightly lower within the orgone accumulator* [he means, within the inner chamber], and lowest in the air of the room surrounding the orgone accumulator, at least three feet distant and at the same height."[10]

In another of his writings, which the present executor of Reich's estate has seen fit not to republish, Reich describes his meeting with Einstein, but this time—for the first and

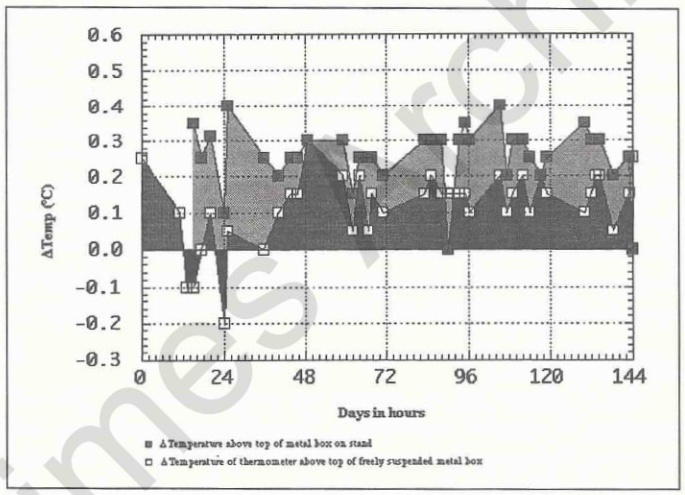

Figure 7. Comparison of ΔT curves of Figures 4 and 5.

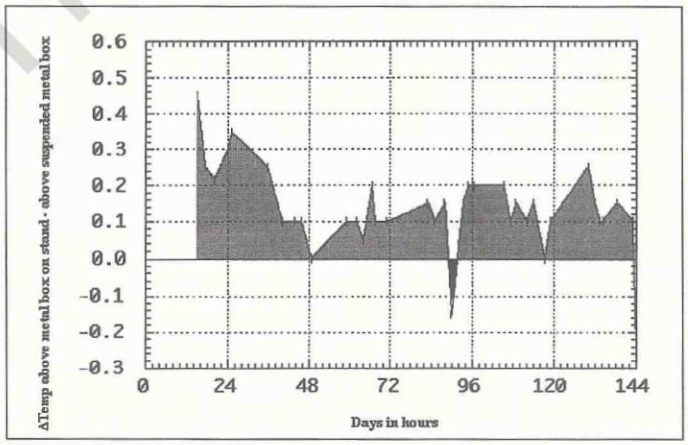

Figure 8. Curve for ΔT_2-ΔT_1.

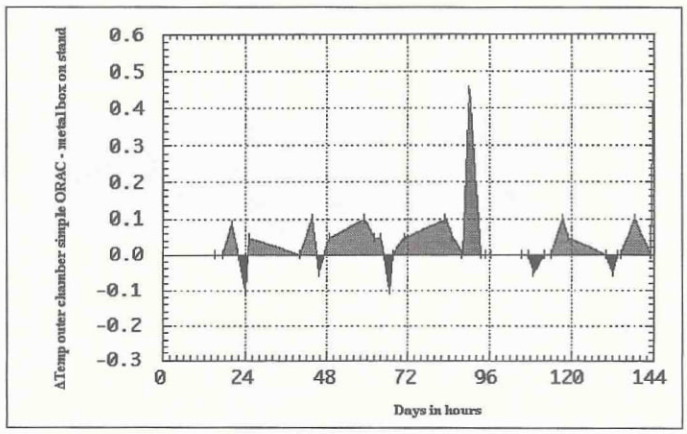

Figure 9. Curve for ΔT_3-ΔT_2.

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only time—with direct reference to the problem of the difference between the inner chamber and the outer one. Since the top of the metal box inside the ORAC is a thermal conductor plate, were the energy radiating through it thermal, it should equalize the regions of space above and below it—which it does not. In the course of a reconstructed outdoor demonstration of the thermal phenomenon being given to an imaginary interlocutor, a "rational electrophysicist," Reich writes: *"The result remains the same. The thermometer inside the orgone accumulator shows a temperature several degrees lower than the thermometer above the upper metal surface. . .* When I told an eminent physicist about this fact he declared it to be impossible. *The temperature within the orgone accumulator is always lower than above its upper surface.* This fact is difficult to explain." However, nowhere did Reich or Einstein actually measure the temperature inside the metal box, beneath the top metal plate, in the course of their interchange. The fact that it is lower than the temperature above the top plate cannot be inferred from Einstein's interpretation: that when the metal box is in direct contact with the tabletop, the temperature above the top plate ceases to present a positive ΔT value. A short while later in the same publication, Reich plunges head-on into a description of the crux of the "Einstein affair," as he would later call it:

> I had been observing the temperature difference in my basement laboratory since 1939. In closed rooms, it is rarely higher than 1-5°C, apparently because the orgone radiation from the walls and from objects in the room is too strong. I presented my finding to a man who is a great authority in physics. At that time I did not yet know about the results of measuring the temperature in the open air because I had discovered the atmospheric orgone energy only a short time before. The physicist patiently listened to my story in the course of a four to five hours' conversation. The fact that the temperature above my accumulator was several degrees higher than inside he considered impossible. The difference between the box temperature and room temperature, if true, he considered, like you, a "bombshell." He expressed the wish to observe the apparatus for some weeks. I put one on a table in his basement. The control thermometer I suspended freely in the room, at the same height. He convinced himself in my presence of the temperature difference and observed its constant existence over a period of two weeks. He had promised me to support the orgone research if he could confirm the existence of the temperature difference. Now he had confirmed it. Then he called in an assistant. The assistant soon found "an explanation." The temperature difference, he opined, was due to "convection of heat from the room ceiling to the table top." If his interpretation had not been irrational, he would, of course, have convinced himself of its correctness or incorrectness by conscientious experimentation. All he would have had to do was to put the control thermometer at the same height with the orgone thermometer above the table top. This would have shown him that the temperature difference continued to exist and that his argument was incorrect. His chief took the trouble of taking the apparatus apart and found a temperature difference between above and below the table top. This phenomenon was well known to me. It is explained by the stopping of the soil orgone radiation at the lower side of the table top and has nothing to do with the temperature above the apparatus. If one interrupts the convection of heat from the room ceiling and replaces the wooden table top by a metal one, thus eliminating the difference, the phenomenon T_o-T nevertheless continues to exist. Of these measures, the high authority in physics did not think. The simplest procedure, of course, was that of excluding all heat influences as may exist in a room to measure *in the open air* as we just did. This excludes room ceilings as well as table tops.

E (Electrophysicist): The superficiality of this assistant is amazing. After all, that's no way of dealing with a gigantic problem. How did it come out?

O (Orgonomist): As usual, I refuted the assistant's interpretation by the measurements in the open air, where not only the objection is eliminated but where the phenomenon is even more marked. I submitted the results of these new measurements to the physicist but never received an answer. I never quite understood this but I cannot help feeling that this man, who had understood my problems and findings very well, simply wanted to keep aloof in order not to engage himself although he must be convinced of the correctness of my findings.

E: That must have been a bad blow.

O: That it was. I had to think of the many great and small discoveries which, in less robust characters, are done away with in this manner only to be newly discovered, or, rather, to be stolen, by others.

Now, this passage also is far from clear. Indeed, the way to disprove the significance of the effect of convection is not to expose the air thermometer also to it, by placing it over the table top. If one does so, it becomes much harder to detect the positive difference, since the convection of warm air rising from the table top increases the temperature read by the thermometer, and any thermal radiation arising or reflecting from the table top will also contribute to such rise. What was needed was to study the naked metal box suspended freely like the air thermometer was. Secondly, the reference to radiation from the soil itself further muddies up matters, since it appears to deny the existence of convection currents beneath the table top and replaces them instead with the notion of radiation arising from the earth. However, Reich did not seem to notice the paralogical error he was hereby incurring, since the stoppage of such radiation arising from the soil by the underside of the table top would warm up the underside and not cool it, as the Infeld

. . .The observed production of anomalous heat would require the latter to violate entropy and spontaneously accumulate in the outer chamber of the ORAC. Such a notion is not compatible with the electromagnetic notion of passive absorption in blackbody theory—since it requires an active drawing of the radiation field that prevents the equalization of temperatures predicated upon thermal diffusion of energy.

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argument based on convection suggested it did.

In this same 1944 publication, Reich argues through the mouth of a rational electrophysicist being convinced by the evidence regarding the existence of a different energy form: "As we know, heat is only a *form of manifestation* of energy anyhow, and not energy itself. But I cannot as yet think of a connection between orgone and heat."[9] Even though this was written in 1944, before Reich's discovery of the "orgone motor set-up," there is no reason to believe that Reich was ever able to solve the problem of the relation between orgone and heat, either theoretically and mathematically, or experimentally. However, he steadfastly held to the view that the radiation responsible for the observed thermal anomaly atop a metal box could not be heat, since "in caloric research, one finds always the same thing; all temperature differences result in an equalization from the higher to the lower temperature which takes place more or less fast or slowly according to the conductivity of the substances involved."[9] In other words, it is well-established physics that heat can only dissipate—by conduction, radiation, absorption, and re-emission—whereas the observed production of anomalous heat would require the latter to violate entropy and spontaneously accumulate in the outer chamber of the ORAC. Such a notion is not compatible with the electromagnetic notion of passive absorption in blackbody theory—since it requires an active drawing of the radiation field that prevents the equalization of temperatures predicated upon thermal diffusion of energy. The reader will realize that from the viewpoint of electromagnetic theory, whether classical or treated by Special Relativity, fields originate in emitters that are as near to being perfect absorbers as they conform to the stochastic distribution curve of a blackbody. But effectively what Reich was invoking is the capacity of receivers to set up a draw field—radiation which is not emitted outwards by a mechanical potential that disperses it, but is drawn inwards and made consistent in this drawing, the field consisting not of emission, but of extraction from any emitter, which can even be the surrounding medium.

With respect to the results we report in this study, one is led to conclude that the anomalous thermal phenomenon is a verifiable reality which is not explainable by convection currents. The question that we then pose is whether this thermal anomaly is due to the reflection and radiation of thermal energy present in the atmosphere and supposedly constantly injected by the sun, or instead to some nonelectromagnetic energy form.

In the indoor results, it is evident from this critical control, as well as from all measurements of the outer chamber of a simple ORAC, that whatever the source of this radiation, it can be trapped to increase the temperature of the outer chamber. The box then appears to be functioning as a passive contraption that draws energy from its surroundings. Likewise, (as we will show in a future paper) the outdoor results obtained in the shade suggest that any box, whether made of metal or dielectric, and even of such a poor dielectric as wood (which Reich qualified as a "poor orgone absorber"), will draw this energy from an atmosphere charged by solar radiation, even though the boxes are not directly exposed to it.

But whereas the indoor results, as well as the results obtained outdoors in the shade, all suggest that metal enclosures, whether insulated or not, are able to draw some form of energy which is responsible for their positive temperature difference towards air thermometers, the experiments conducted outdoors with the devices directly exposed to solar radiation only permit an analysis in terms of absorption. So it is here that we again encounter the blackbody problem. Reich was obviously mistaken in thinking that heat is not a form of energy. In fact, had he just discovered that thermal radiation flows both entropically by a mechanical potential and negentropically by a reverse potential, under assignable conditions, this would have been no less a bombshell in physics than if this radiation were not thermal, and fully deserving of the dialogue between Einstein and himself which Reich reconstructed as follows:[9]

> [Reich:] (...) Then [at last] one finds [with a suitable arrangement of materials] indeed *a constant temperature difference without a constant source of heat of any known kind.*
>
> [Einstein:]: I was prepared for all kinds of surprises, but this would really be a bombshell.
>
> [Reich:] I am afraid that when this "bombshell" is going to explode, many a physicist will dig in behind an impenetrable wall of "interpretations" which are to explain the phenomenon away.

But Reich could not formally show that heat was not energy, nor that thermal energy was not responsible for the phenomena observed—since, after all, he could show that the synthesis of thermodynamic theory with electromagnetic theory might well be premature. Heat might have heretofore unknown properties, and Reich lacked a formal experimental proof that excluded a treatment of thermal energy that would account for the observed phenomena. One might even construe Erhenfest's theory of quasi-entropies and the quantum-mechanical notion of a zero-point energy as openings to revise any unification of electromagnetic and thermal phenomena.

With his invention of the ORAC and his theory of an orgone energy distinct from thermal energy (in *Ether, God, and Devil,* he writes that "most orgonotic functions are cold," and that only reflection from metal and concentration in dielectrics by attraction or draw, can "create heat"), Reich felt that he could legitimately claim that his ORAC functioned not like a passive blackbody, but like a negentropic cavity that drew this nonelectromagnetic energy from the surrounding environment. The ORAC had to be conceptualized as a passive arrangement that actively drew or attracted (via a reverse potential) and then trapped (by its reflecting inner cavity) a fixed percentage of the constant atmospheric flux of the "orgonotic particles" passing through it. This capture of orgone energy adds energy directly to the medium in the enclosure, and it is only the reflection of this energy within the metal cavity, as well as outside of it, from its external surface, that is detected as heat. In his last published book, *Contact with Space,* Reich would systematize the two direct transformations of OR energy, *caloric and motoric,* the former involving *"inner friction"* of gases and solids, and the latter *mechanical motion* as OR energy transferred the momenta of its particles to matter. He added, "Raw as this thought is, it deserves consideration."[11] Clearly, Reich considered that the thermal effect of the ORAC was not a transformation of the kinetic (or the intrinsic) energy of the air molecules present within the enclosure, via intermolecular collision, but a far more direct process whereby a nonthermal, nonelectromagnetic radiation field, if sufficiently concentrated, would convert some of its energy into the sensible thermal energy that we measure with thermometers.

These results, taken in isolation, do not permit one to make any conclusion other than that there is a sensible thermal anomaly that occurs atop Faraday cages without any apparent source of heat, and thus in defiance of the Second

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Law of Thermodynamics. As thermal energy does not arise *ex nihilo,* it must result from the conversion of some other energy, evidently not thermal. So the results compel us to consider how energy comes to assume the form of sensible thermal radiation. We may assume this radiation to be electromagnetic, but since there are no real filiform electromagnetic rays, except in the speculative limit when the frequency of light would become infinitely great, what we mean is that we assume this thermal radiation to be locally embodied in the form of photons or quanta. From where we stand, this can only emphasize the question of what then constitutes the continuum of excitation that generates those thermal photons in a particular locality, and systematically so—what is the non-electromagnetic filiform wave function that locally produces those thermal photons? General Relativity tells us that any electromagnetic disturbance that could be filiform would have to necessarily take the form of a null geodesic of Spacetime. Yet, no energy has infinite frequency, and thus no electromagnetic disturbance can be filiform; on the contrary, every electromagnetic disturbance is and must be discontinuous, and those that present continuous distributions may be nothing more than an epiphenomenal smoothing of the discontinuous and local production of photon units which reflects an underlying non-electromagnetic wave-function that is susceptible to filiform treatment, even and above all with respect to the problematics of the manifold(s) of Space and Time. Blackbody radiation may well be just a representation of an underlying permanent energy flux capable of deploying the required conditions for a consistent continuum. And, in this domain, it is far from ruled out that sensible thermal radiation cannot take subquantic forms—any more than when one considers latent thermal energy to be the intrinsic energy of a molecule, one is necessarily asserting that this energy exists, as such, as a quantic reality of an electromagnetic nature.

As we will show in a future paper, it is possible to measure the latent thermal energy of either a locality or a blackbody and correlate its variation with the changing magnitude of the sensible thermal anomaly described in the present report. And, likewise, we believe we can demonstrate both formally and experimentally how the blackbody distribution results from the shedding, above all, by electrons, of kinetic energy that was initially absorbed from exposure to an electrified flux of massfree energy. The implication here is that electricity exists in two distinct quantum forms, massfree and massbound, and that the former, being in fact radiative, interacts with charged matter to yield that smooth distribution that includes thermal photons. So, for now, the question will remain open with respect to the simple Faraday cage, of whether the anomalous flux of sensible thermal energy is a conversion resulting from the local shedding of "specific latent heats," or is the result of a charged interaction with massfree radiation of a non-electromagnetic nature. Or both.

Acknowledgment

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References

1. Reich, W. 1947. *The Cancer Biopathy,* Farrar, Strauss & Giroux, New York, NY; Reich, W. 1951. *The Orgone Energy Accumulator,* Orgone Institute Press, Orgonon, ME.
2. Einstein, A. Letter to Dr. W. Reich, February 7, 1941.
3. Reich, W. 1953. *The Einstein Affair,* Orgone Institute Press, Orgonon, ME.
4. Reich, W. Letter to Prof. Einstein, February 20, 1941; Reich, W. 1947. *Cancer Biopathy, op. cit.,* 117-127.
5. See Reich's letter to Einstein of February 6, 1941.
6. Reich, W. 1947. *Cancer Biopathy, op. cit.,* 113.
7. Clark, R. 1973. *Einstein, the Life and Times,* Hodder & Stoughton, London, England, 534-535.
8. Reich, W. 1944. "Orgonotic Pulsation," *Int. J. Sex-Eco and OR Rsrch,* 3, 97-150, 146.
9. *Ibid.,* p. 144.
10. Reich, W. 1951. *The Orgone Energy Accumulator, Its Scientific and Medical Use, op. cit.,* 20.
11. Reich, W. 1957. *Contact With Space,* Core Pilot Press, New York, 218.

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More recently, the Correas have conducted theoretical and experimental research in biophysics and thermoelectric plus electrogravitic energy conversion, the subject of an extensive effort underway to publish this work.

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The Perfect Thermodynamic Engine in the Physicists' Experience

Maurizio Vignati*

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Originally appeared as Chapter 8 of Vignati's book, Crisis of a Dogma: Kelvin and Clausius Postulates at the Settling of Accounts *(Astrolabium, 1993).*

8.1 Perpetual Motion in Physics

Three distinct kinds of perpetual motion are known in physics and they are characterized, mainly, in relation to the different violations of the fundamental physical principles which their existence would imply.[19]

The two main principles are:

a) The principle of conservation of energy, which in thermodynamics takes the name of the first principle of thermodynamics;
b) The principle of the impossibility to exploit the heat of the sources completely, or the second principle of thermodynamics.

The first type of perpetual motion would violate the first principle of thermodynamics, creating energy from nothing.

The physicists are rightly very attached to the principle of conservation of energy since it is one of the most solid, and anybody trying to affirm the contrary is bound to be considered by them in a highly critical way. The second type of perpetual motion, on the other hand, would violate only the second principle of thermodynamics and would be able to completely exploit the heat of one source only. It would make it possible to obtain energy from that natural heat reservoir which is built up by the environment in all its forms.

> The second principle of thermodynamics was born with a peculiarity: it is the principle of impossibility *for mankind*. From this point of view the principle is undoubtedly true, because it really is impossible for mankind to find what it does not want to look for.

In short, it would do nothing else but absorb the microscopic mechanical energy of the single atoms of this reservoir, energy which is incoherent, since the vibratory movements of the atoms may be considered random (as shown by the Brownian movement), converting it into coherent mechanical energy, such as that of a piston which moves alternately or a transmission shaft which rotates. In the historical part of this book we also saw that as long as the caloric theory of heat was considered valid, there was no need to describe this type of perpetual motion. It was purposely invented to negate its existence for the sole purpose of continuing to use Carnot's reasoning by *reductio ad absurdum* (or, proof *ab absurdo*).

The perpetual motion of the third kind would not violate either the first principle of thermodynamics nor the second one. In simple terms, it would not create energy from nothing and would not completely exploit one source of heat only. A typical example of this type of motion would be that of a spinning top which turns without friction or a planet which rotates around a star in the absolute void of matter or a wave propagating in a medium completely free of viscosity, etc.

They are all systems which would not be able to supply energy continuously. As regards the perpetual motion of the second kind, we have already seen that in physics a connection is made between this type of perpetual motion and the spontaneous inversion of an irreversible transformation, since this last phenomenon (almost impossible) would be the only one able to violate that very principle. Besides, as already seen in the historical part of this book, the theoretical physicists are interested in carrying out research into the causes of the practical impossibility that a transformation may unfold in a direction contrary to the natural one. What proves particularly difficult to explain is the reason for which the natural thermodynamic phenomena have a preferential way of direction, notwithstanding the fact that at a microscopic level, the collision phenomena between molecules are equally likely to take place in one direction as in the reverse one.

Let us imagine, for instance, a body in which, thanks to the equal probability that molecular collisions may proceed in one direction or in the reverse one, a certain part of this body would start becoming colder, while another part is becoming warmer. This hypothetical phenomenon describes, in inverted terms, what happens when two bodies at different temperatures come into contact with each other. This hypothetical inversion would produce, then, a violation of the second principle of thermodynamics. It follows that the impossibility that such an inversion might occur spontaneously, even if not explained theoretically, is tantamount to the impossibility to violate the second principle of thermodynamics. In short, we can say that the only way in which it is deemed possible that the second principle of thermodynamics might be violated would be in the unlikely event that a thermodynamic phenomenon may spontaneously invert by itself. In fact, the thermodynamic theory has ruled out the possibility of violating the second principle by pairing two opposing machines.

8.2 General Properties of a Perfect Thermodynamic Engine

At present, the impossibility to realize the perpetual motion of the second kind has been elevated to physical principle: the second principle of thermodynamics. It is important to note, though, that the definition of perpetual motion of the second kind seems improper, since it sets this

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phenomenon in the same category as the other two, while they are characterized by peculiarities which the second one may not have. In fact, if we accept Clausius' criterion, according to which the heat contained in a body is the expression of the kinetic energy of its molecules, the quantity of heat contained in a body of finite mass may be considered a finite quantity, since even finite seems to be the sum of the kinetic energies of all the molecules, in respect to the baricentrum of the body of which they are part.

The above mentioned particularity lies in the fact that the first and the third perpetual motion can always be imagined in isolated and finite systems, while the second one not always. The second kind of perpetual motion could only really be perpetual if the isolated system contained an ideal heat source: a body with degenerate physical properties, able to supply indefinite quantities of heat without changing state. Whereas, if a perpetual motion of the second kind were put in an isolated system with finite mass, it couldn't always be perpetual. It is easy to understand this, if one thinks that, by destroying the heat of the system inside which it is held, sooner or later it would consume all the kinetic energy of the molecules or (in the quantum interpretation of energy at zeropoint) bring the system to a minimum of molecular kinetic energy. But this cannot occur, because of the third principle of thermodynamics, so that the device would stop well before having reached the absolute zero.

What has been said before is valid, obviously, if all the work produced by the engine is stored in another form, other than heat. Whereas, if all the work produced were to be reconverted into heat, the system would not produce any mechanical energy capable of being stored, but could produce only that work the sole result of which was friction, as happens, for instance, during the movement of a body in a viscous fluid. In the latter case, without doubt a perpetual motion would be produced within the isolated system, not impeded by the third principle, but this would not be able to alter the thermal energy content of the isolated system in which it were placed. An engine able to realize such a state would continuously absorb heat from some part within the system, but somewhere in the same system in each time unit the exact same quantity of heat which had been extracted would reappear.

As we shall see in the following pages, this exact type of functioning has been accomplished experimentally, in a device invented by Dr. Xu Yelin, researcher at the Academy of Science in Beijing, China. On this basis, he has drawn up a new principle: the principle of circulation of energy. Anyway, since such a system would not consume heat and would not produce work, it could quite rightly be defined as a perpetual motion of the third type: a distinct kind of perpetual motion in which heat and work are the forms of energy which, within the system, continuously transform one into the other. As it is possible to see, the perpetual motion of the second kind, depending on what the destination of the useful work is, may be placed in a different class. So as to avoid confusion, it would be better not to enter into the merits of how the produced work was to be used. For this reason, as said before, it would be better to renounce defining it as perpetual motion of the second kind and define this engine as a perfect thermodynamic engine, designated as a Perfect Thermodynamic Engine (PTE).

So, according to what has already been said, by setting a PTE in a closed system and converting all its work into heat, a continuous circulation of heat could take place within the system. Since this phenomenon would not require ideal sources, it would have a low degree of abstraction.

Because of the interpretation which is currently given to the second principle of thermodynamics, our thermal engines are conceived so as to need more than one heat source and, furthermore, at least one of them must absorb heat. In practice, the principle demands the presence of at least two heat sources with different temperatures, one of which is devoted to receiving waste heat. In fact, if an engine existed which were capable of completely exploiting the heat of all the sources with which it were in contact, its efficiency would be unitary, but this is precisely what the principle itself rules out.

Therefore, in our thermal engines a part of the absorbed heat is transformed into useful work, while the rest is lost to mankind (*cf.* Kelvin) and must always be wasted. In an internal combustion engine this latter heat quantity is the one dissipated into the air by the radiator. In such an engine with unitary efficiency the radiator would not be required, since all the heat of combustion would be exploited. However, it is important to notice that this kind of engine would not yet constitute a PTE, in the sense indicated above. The PTE would do much more than exploiting the heat of the fuel; it would not need fuel at all. The idea that such a system could exist may seem completely absurd, and this is the reason for which the second principle still seems so sound, in the way in which it was born and is well known.

Nevertheless, as strange as it may seem, this is exactly what we were able to calculate in the previous chapters. The fact is that the PTE, which we have shown to be conceivable, would be able to absorb the environmental heat in which it were placed. In fact, it would be able to maintain, within it, a zone colder than the environment in which it were placed. This colder zone tends to maintain itself, because the system which is inside it produces work (as a whole) and so extracts heat from it, but the temperature of this zone (or body) may not vary if the proper conditions of insulation from the rest of the closed system are created for it.

If the proper conditions of dynamic equilibrium are created, the engine works continuously because heat enters into it continuously, and this happens because the engine is continuously operating. We could define this process as a new type of chain reaction: a thermodynamic chain reaction.

Another very important property of a PTE consists of the fact that it allows friction or passive resistance among its processes. This conclusion may be easily obtained from what has been previously said about heat circulation in a closed system in which a PTE would be enclosed.

Indeed, friction or viscosity phenomena produce heat, but if the quantity of heat produced within the engine by friction were less than the quantity of work that the ideal system (without friction) were able to produce, this fact would do nothing but proportionally decrease the quantity of heat which the system would absorb from the environment. In other words, if a certain percentage of the maximum work which a PTE were able to produce in ideal conditions were lost by internal friction and converted into heat, it would result in a less useful work production, since the internally consumed fraction would be missing, and the PTE would only stop running if this percentage became 100%.

However, since we can change the thermal resistance

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existing between hot source and cold body, the overall efficiency would remain unchanged. In fact, in such conditions the system would absorb only the amount of heat equivalent to the residual useful work from the environment, so that the efficiency would still remain unitary.

In short, a PTE can allow passive resistances, inside it, involving work no greater than the maximum useful work it can possibly produce in theory. A generic PTE must possess this characteristic, regardless of the way it is made up. Thus, if it were possible to maintain the internal friction below a finite limit, the PTE based on the Ericsson cycle would have a real possibility of existing.

This condition is not technically impossible to achieve!

If our conclusions are right, we might say that mankind has been very unlucky on this occasion. Indeed, if Clausius and Kelvin had not extended the use of Carnot's proof *ab absurdo* to the dynamic theory of heat, they would not have been able to mistake the meaning of a *maximum of efficiency* with that of *the maximum efficiency.*

If, notwithstanding this, the physicists had accepted the observations made by the intuitionists, maybe today studies on the perfect thermodynamic engine would be more advanced, since, in such hypotheses, those who uphold the possibility to realize this perfect engine would not be ridiculed.

8.3 History and Chronicle of Ostwald's Engine

The perfect thermal engine, according to our definition, is also known in physics under the name of Ostwald's engine. In 1924 Wilhelm Ostwald, Nobel Prize winner in 1909 for chemistry, wrote notions very similar to Carnot's in one of his books, according to the interpretation of Clausius and Kelvin. In a passage of his arguments he still expresses these concepts:

> If Carnot's principle were false, and if it were possible to build two perfect thermal engines with different efficiency, one could pair these two engines in such a way that any amount of heat would be carried from the lower temperature to the higher one, and also obtain a quantity of work as great as desired. This work would not be created *"ex nihilo"*; it would involve the consumption of a corresponding heat. But this heat could be taken from the environment in any amount, since our pair of engines carries heat freely from a lower temperature to a higher one without any expense. Thus we would have an engine that, without violating the first principle, would violate the second, and that would absolutely have the practical value of a machine able to produce perpetual motion. It is true that it would not obtain work from nothing, but would obtain heat without any value, which would continually renew itself following the consumption of the work obtained. *Experience shows that an engine producing a perpetual motion of this kind is impossible nonetheless.* One gives the name of perpetual motion of the second kind to such an engine, since it contradicts the second principle and to distinguish it from an engine which contradicts the first principle, which is called a perpetual motion machine of the first kind. By negating the possibility of an engine of the second kind, one expresses what is fundamental in the second principle.[33]

Once more Ostwald describes the pairing of two opposing machines, to deny once more the overall functioning. However, it is logical to ask oneself what the experiences mentioned by Ostwald could have been, since, indisputably, no scientist had ever devised, not to mention attempted, any experiment to build a PTE.

It is likely that Ostwald implicitly appealed to all those unscientific attempts, by rather untrained or visionary inventors, who dedicated their spare time to researching into perpetual motion during the last century. It is difficult to say to what extent the remarks of the Nobel Prize winner Ostwald influenced other authors.

What remains true is that, while Clausius used the proof *ab absurdo* considering the violation of the axiom invented by himself absurd, after Ostwald's remarks many authors of thermodynamic texts justified the second principle of thermodynamics on the basis of the failure of undetermined (or better: nonexistent) experiments, creating a real historical and ideological falsehood. Probably, following the footprints of their more illustrious predecessor, many authors felt entitled to award scientific value to what was not scientific.

Undoubtedly, the scientific community must have been tormented for a long time by hordes of inventors. Indirect proof of this thesis is supplied by a famous edict, announced in 1775 by the Academy of Science of Paris. With this resolution the Academy announced that memoirs concerning perpetual motion, among other things, would not be accepted anymore. Despite the fact that more than two centuries have passed since that date, this situation still persists.

A documentary proof of this fact may be found in the January 1988 edition of the Italian scientific magazine *Sapere* (in English: *Knowledge*). With a full page announcement, readers are informed about the fact that often (textual) the magazine receives parcels containing projects of perpetual motion engines. However, the magazine communicates to make the 1775 edict its own, refusing the publication.

Such behavior would be condemnable if it were anomalous. However, it is quite common behavior, and it is logical behavior too, since it seems very natural that it is the directors of such magazines that have the authority to choose what kind of *knowledge* their readers must *not* be informed about. We would need to look for other reasons to condemn it. For the time being, no scientific review publishes papers concerning works which are contrary to the second principle. Therefore, Ostwald's engine seems to be something that physicists must not mention, unless they deny it can exist; a terrorizing idea, which is better not to call to mind, like an original sin of which to be ashamed.

Many plans for perpetual motion engines (of various kinds) are certainly contained in the archives of patent departments all over the world. Unfortunately, in this case too there is no way of obtaining information about such patent applications, since they are invariably rejected and not published on the Bulletin of Patents for Inventions. It is even said that some of these departments have equipped themselves with pre-printed forms, maybe to speed up and ease the rejection of such patent applications.

In short, the situation being as it is, it is not very easy to find news and data on this subject. But, even if the scientific magazines employ qualified and relentless experts (referees), the same cannot be said for the mass media, although a scientist had recently promoted the need for the unspecialized press to make use of qualified scientific censors too.

Since such proposals (fortunately enough) have fallen on

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deaf ears, in the eyes of some conservatives and brakemen to the bitter end, sometimes rather embarrassing news is disclosed. Two such cases have occurred recently. The second one, in chronological order, is known to all under the name of *cold fusion*; the first one is virtually unknown to all, and it is the announcement of the construction of a perfect thermodynamic engine, able to exploit environmental heat.

In fact, on October 7, 1988—only nine months after the learned announcement of the magazine *Sapere*—the Italian newspaper *Il Messaggero* (in English: *The Messenger*) published a disturbing piece of news, disclosed by the New China Agency, the official information press service of the Chinese government. According to this announcement, Dr. Xu Yelin, a researcher at the Academy of Science in Beijing, had planned and manufactured a Perfect Thermodynamic Engine.[34] (See Figure 8.5.)

In spite of the importance of the news, an almost invisible paragraph on the eleventh page was dedicated to this news by the newspaper for one day only. Nevertheless, this news was broadcast in a news bulletin by the RAI (Radio Televisione Italiana) and was most probably disclosed by other unspecialized information services.

As was foreseeable, however, the announcement aroused no interest in the specialized news world. I think I am right in saying that not even one line was dedicated to this news in the Western world. For the inflexible critics of the specialized reviews, it cannot have been difficult to believe that Dr. Xu Yelin had made a blunder.

Besides, contrary to the case of the explosive press conference convened by Fleischmann and Pons, it was, after all, a very small announcement made by an agency. It would be better not to create a sensational case, they must have thought; it would be better to wait prudently. But without looking into it.

But, thanks to the courtesy of Dr. Xu Yelin himself, I own a copy of his work. I am very happy to show in these pages what he has done.

8.4 Xu Yelin's Perfect Thermodynamic Engine

Yelin's thermodynamic engine is based upon the pairing of two physical systems with different thermodynamic properties; they are formed of two simple metal pieces. It is known that if two metallic bodies of a different nature are placed in reciprocal contact, a potential difference takes place between them.

In Figure 8.2 a generic example is shown. Even if the potential difference generates an electric field E, it cannot generate a stationary current. A current only flows over a very short period of time, at the moment in which the two bodies are placed in contact. In fact, by closing the circuit, a configuration is generated in which two equal and opposed potential differences are encountered along the circuit, so that no current can be generated.

The origin of the potential difference must be attributed to the different work function for the electrons which different metals have at the same temperature. At the same moment in which different metals with different work functions are placed in contact, in the contact zone a displacement of electrons from one metal to the other takes place. When the system reaches a new equilibrium condition, the flux of electrons ceases, so that afterwards the potential difference will only be subjected to very slight statistical fluctuations, caused by thermal agitation.

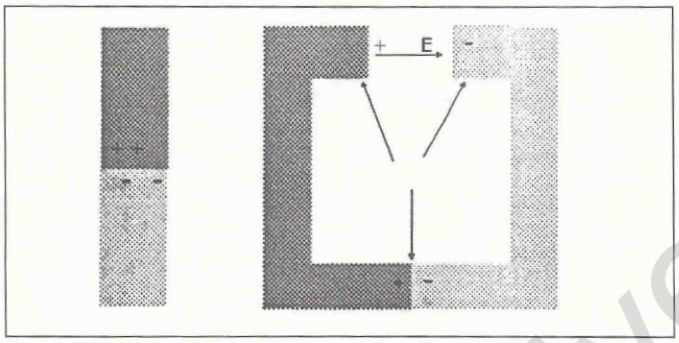

Figure 8.2. Couple of jointed conductors. When two conductors of different nature are placed in reciprocal contact, a very small current flows for a short time interval, creating a difference in voltage between the conductors. Such voltage difference is the same all over each conductor, even in the contact zone, so that no net steady current can be produced by the couple, if the system is at a uniform temperature.

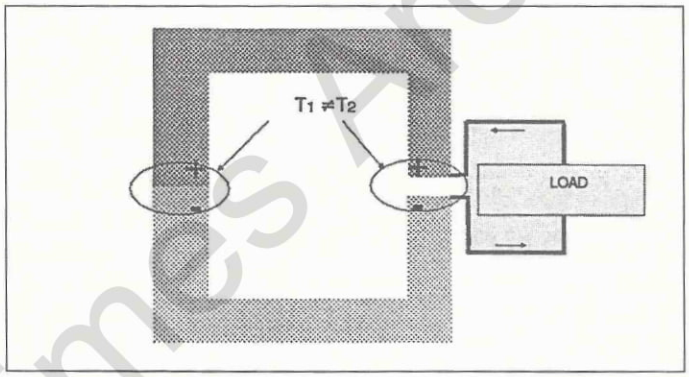

Figure 8.3. Thermocouple. If two conductors of different nature are placed in reciprocal contact and the contact zone is at a temperature different from the temperature of the remaining system, a difference arises between the electric potentials generated, so that a net steady current can flow through a load.

In order to make it possible for the system to produce an electric current, the temperatures of the two junctions must be different. This case is shown in Figure 8.3. The system shown in Figure 8.3 realizes what is defined as a *thermocouple*. As far as we know, this arrangement of elements was the only one able to cause a steady flow of electrons in a pair of metals. Yelin has devised a different way, which achieves a physical separation of the two metals at one of the two junctions, which still permits the current to flow through the free space existing between the two metallic bodies, devising in this way a new type of junction.

The new type of junction is electric and not thermic too; in fact, in a conventional junction of a thermocouple, the two junctions are in electric contact and in thermal contact as well. So, at this junction, the two metallic bodies cannot have two different temperatures, at the junction point. However, in Yelin's device this is possible but, at the same time, the electric current can flow, being generated by the evaporation of electrons from the portions of metal which are enclosed in the ampulla. Yelin uses two well-known phenomena in his device: the contact potential difference between metals and the electron emission of metals in a vacuum at environmental temperature. Even though these phenomena are already known, they have never simultaneously been used for the purpose in question. With these elements Yelin has manufactured what he defines as the

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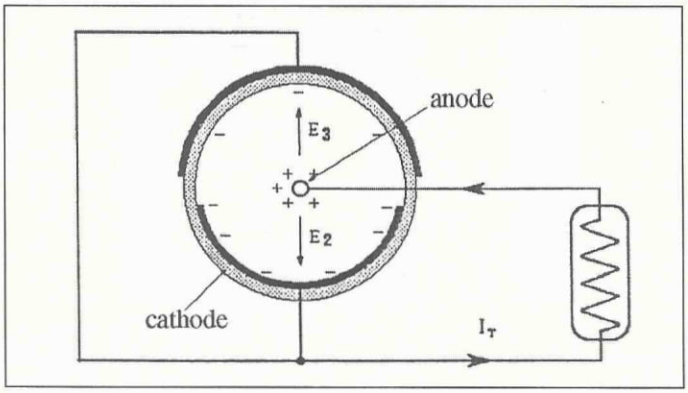

Figure 8.4. Xu Yelin's non-bias diode. The non-bias diode is constituted by a glass tube deprived of air. In the vacuum two electrodes are enclosed, one small (at the center), the other one bigger (half-cyclinder). Outside, a second half-cyclindrical electrode is connected and it has the (auxiliary) function to focus the electronic stream upon the central electrode, for a higher output current.

Cina

A scientist invents the perfect engine

Beijing – A Chinese scientist holds to have invented a perfect thermodynamic engine that is able to produce electric current exploiting the environmental temperature only. The news, reported last week by some press sources, has been endorsed by the agency "New China," according to which Xu Yelin, researcher in the Institute of Biophysics of the Academy of Science, has built and shown the functioning of the new engine.

The device is able, according to its inventor, to produce a small electric current by exploding the sole ambient temperature.

Figure 8.5. This is the prominence gained by one of the most important scientific events of all times. A laconic and skeptical lampoon reports, perhaps only for duty of information, the unexpected event. The indifference of the Western scientific world plays its meaning down; the press diminishes its importance, levelling it to a car accident. Stealthily, a new age has begun. (Reprinted from *Il Messaggero*, October 7, 1998, page 11.)

non-bias diode (a diode which does not require polarization).

Substantially, this system exploits the different flux of electrons which cross the free space existing between two electrodes with different surface but equal coefficients of electronic emissivity. Yelin's idea is to make the circuit close by means of a system that allows the creation of a corresponding amount of energy produced in the form of electric current. This equivalent is heat. In fact, he exploits the heat of evaporation of the electrons belonging to the metal surfaces. Having physically separated the metals at one junction, two slightly different operating temperatures may also be established between the two electrodes. Two phenomena can take place in the two electrodes: evaporation of electrons, with the consequent extraction of thermal energy, and the impact of electrons coming from the other electrode, with cession of thermal energy. Yelin shows that the first phenomenon prevails in the cathode of his diode, the second in the anode. The results depend on various factors, among which are the load resistance value and the surface area of the electrodes.

In the operating conditions foreseen, the cathode tends to become spontaneously colder than the environment, the anode warmer. But, owing to the different entity of the two opposed thermal phenomena, also determined by the different extension of the electrodes themselves, on the whole the diode behaves like a body which is colder than the environment. The production of current is strengthened by means of surface treating, consisting of Cesium activation and an oxidation process, similar to the ones practiced in the production of thermionic valves.

The two evaporation currents do not require any external stimulation, since they are generated by the thermal agitation of the electrons belonging to the surface layers of the electrodes enclosed in the vacuum tube. So, as far as I can see, Yelin's engine uses the coupling of two thermodynamic systems with a different ratio between energy produced and heat absorbed, although this schematic sub-dividing, analogous to the one proposed by us, seems quite difficult to recognize. The fact is that in the coupling shown in Figure 6.4 [not reproduced here], concerning Ericsson and Carnot cycles paired up, it is possible to identify and separate each of the two machines, without this separation altering their running, compared to the case in which they work together, since they are reversible. This would not occur if two irreversible Ericsson cycles were used, as shown in Figure 6.8 [not reproduced here], since in this case the separation would alter the running of each cycle, as already pointed out.

In Yelin's engine the system is analogous to this later case, since the two opposed phenomena are so strictly interlaced that it is difficult to recognize this general layout.

The work published by Yelin is divided into various parts. After having described the theoretical fundamentals on which the functioning of the non-bias diode is based, it continues with the description of the manufacturing criteria of his device, the illustration of results, and the criteria to check the presence of eventual disturbances induced by extraneous factors. In an appendix he shows the equivalence of energy produced and heat absorbed from the environment, as well as the formulation of the new principle of circulation of energy.

Summarizing the main results, the energy produced depends upon the value of the load resistance. Indeed, if it is null, all the energy is re-absorbed within the diode; if it is infinite it is not produced at all. Therefore, there is an optimum value. Among the various tests to which the device has been subjected, we will mention the following one: a battery formed of 700 carefully selected non-bias cells, enclosed in a very well-insulated container, shielded from external influences, was exposed to the rather slow temperature variations of the laboratory environment and, alternatively, also enclosed in a thermostat, together with a galvanometer, to determine the curve of dependence between output current and environmental temperature.

At 27°C the device formed of 700 cells connected in parallel (each one similar to the one described in Figure 8.4) shows an electromotive force of 5.9 mV and a short circuit current of 2.5×10^{-9} A. Whereas, with a load resistance of 3.5 MOhm, the voltage difference at its terminals is 3.1mV with a current of 0.9×10^{-9} A. At a temperature of 32°C the short circuit current is 5.3×10^{-8} A. In the course of time the electric energy production was registered, finding that it follows seasonal variations: higher during the summer and lower during the winter. In addition, a diagram showing current production capacity in function of the thermostat temperature is given.

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Before publishing his work, Yelin kept his equipment running continuously for one year, without ever finding signs of decrease in performance. In one of his recent letters, he informs me that even after five years of continuous functioning, the electricity produced has remained unvaried. [*The work published in China by Xu Yelin can be found on page 31 of this issue.*]

8.5 Experimentum Crucis for Clausius and Kelvin's Postulates

The small entity of the values reported by Yelin is certainly such as to leave the skeptic in some doubt about the possibility that a system of the type devised by him may supply currents of practical utility, since, for this to happen, the work function of the conductors would have to be drastically reduced, or the coefficient of electronic emissivity would need to be greatly increased. (Things which are by no means impossible. In fact, it is likely that Gallium Arsenide electrodes could bring about some improvements.) But, in line with this principle, it is true that Yelin has come up with a demonstration of unquestionable value, since the theoretical provisions seem to be confirmed by the experiment. Besides, he does not appeal to unknown phenomena but, on the contrary, to perfectly known ones, such as the contact potential difference between metals and Richardson's formula for electronic emission.

The experiment renders macroscopic an effect that should not be macroscopic; this should be enough for the scientific community to repeat such an experiment in other forms and in other laboratories.

Yelin's device could also be submitted to a twofold verification. The first one theoretical, concerning its set up, the second one experimental but, as far as we know, nothing has been done about this. According to its conceiver, the experiment renders macroscopic an effect that should not be macroscopic; this should be enough for the scientific community to repeat such an experiment in other forms and in other laboratories.

In the field of fundamental research (structure of matter at a sub-atomic level), the discovery of the violation of what was once called the *principle of conservation of parity* brought the Nobel Prize to the researchers who discovered this violation. We say this to show that in other fields of science special attention is paid towards a constant verification of principles. The same thing does not happen in the case of the second principle of thermodynamics; it seems to be exempt from this rule, notwithstanding the fact that it is more than 150 years old.

But if science is what it claims to be, from time to time, driven by phenomena which are not explained by current theories, the idea of change must be accepted. However, clearly no one can personally assume the initiative of such an about-face. In other similar cases the appeal to what has been called an *experimentum crucis* (crucial experiment, the result of which can determine a modification of the theory) has relieved everyone of the necessity to assume such great responsibilities. It seems reasonable that, as in the case of disagreements among various political parties which are in power in a government coalition, an irreconcilable disagreement may be resolved exclusively by going back to what legitimates that very government.

In the electoral comparison stated above, the disagreement among parties may be compared to the disparity between an experiment and the current relative theory; the recourse to elections, with the recourse to an experiment the effectiveness of which, in deciding whether the old theory must be abandoned or not, is recognized by all.

Nowadays, the worth of Yelin's experiment does not lie in the amount of energy produced (for it produces only 10^{-10} W) but in its double role as indicator of the failure of a principle, and as *experimentum crucis* which, at the same time, it can play as regards the principle itself.

Thanks to its extreme simplicity and to the fact that it involves physical laws which are very well-known and studied, separately, it possesses this double role. It must be noted that an *experimentum crucis* has never been proposed or thought up in the past for the second principle of thermodynamics, probably for lack of imagination or data. Thus, until now people had good reason to believe that Clausius and Kelvin's postulates were true. Regarding the need for a correction, it would be required as a consequence of the results obtained from the thermodynamic properties of real gases used in ideal thermodynamic cycles and from the theoretical and experimental results obtained by Yelin.

Therefore it seems reasonable to throw out the suggestion that various researchers agree on a combined program of experiments, with the purpose of independently verifying Yelin's claim, in order to decide whether a correction of the thermodynamic theory is necessary or not. I would expect this to happen, if those ideal aims attributed to science were actually honored.

8.6 Some Conclusive Remarks About Science, Culture, and Society

But is science actually like this? Logically thinking, the scientific community should have every interest in verifying Yelin's claim, so that the complete lack of interest in this kind of research seems to be very strange. But let us ask ourselves, then, why some months after the disregarded announcement made by the New China Agency, another extraordinary announcement upset the whole world. In May 1989 the two famous American researchers Martin Fleischmann and Stanley Pons announced that they had successfully carried out an experiment in which an excess of thermal energy was produced during an electrolysis.

Since the liquid used was heavy water, according to the two scientists, the considerable amount of heat produced could only be explained as nuclear *cold fusion*. These are the terms the two scientists used. Everybody knows what an uproar this announcement stirred up. But why, let us ask ourselves, didn't a similar pandemonium occur after the Chinese announcement?

Let us remember that the phenomenon which the two

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electrochemists claimed to have obtained with heavy water and palladium electrodes consisted of a rise in temperature of the water which was much greater than one would have expected on account of the electric power consumed. However, some newspapers quoted a statement made by them, according to which a similar phenomenon could also be observed with normal water. If this is the way things stand, a link should be made between this issue and another well-documented event, which occurred in times above suspicion.

Many people probably ignore that a phenomena of overheating of normal water (not heavy) during electrolysis was noticed in 1843 by James Prescott Joule, and recorded in some notes of his.[8] According to the data quoted by Joule, this phenomenon could only be found with platinum electrodes, a metal which behaves like palladium in many circumstances. Bringing his memoir to a conclusion, Joule expressed the opinion that the explanation of the strange phenomenon could be attributed to some secondary effect. [*Editor's Note:* Possibly the very first evidence of cold fusion?] Furthermore, Joule himself brought the reader's attention to a hypothesis advanced by Faraday, who was inclined to believe that the excess of heat derived from the dissolution of the oxygen in the water.

The efforts which are made against cold fusion seem to be consistent with those made against the perfect thermodynamic engine, and it is not difficult to recognize the same fellows in both groups.

Since I am not an expert in electrochemistry, I don't know, in turn, the true explanation of the phenomenon reported by Joule, but I think that the electrochemists found one for it a long time ago, an explanation which does not appeal to cold fusion. I would be obliged to believe this because, otherwise, one would have to conclude that science had left an energy discrepancy unexplained for a long time, a discrepancy able to call in question no less than the principle of conservation of energy itself.

It is impossible, in such conditions, not to ask ourselves the most disparate questions: what did Fleischmann and Pons see? Did they simply amplify a secondary phenomenon, already noticed by Joule, blundering in ascribing to cold fusion a phenomenon which, even though existing, has another explanation?

Or do things stand differently? In fact, it is possible that Joule had found something that could not be explained at that time (cold fusion or some other phenomenon), later unearthed by the two electrochemists. Besides, why do many conservatives continue to concentrate their efforts in denying legitimacy to cold fusion? What are they interested in denying: the existence of cold fusion, the over-production of heat, or the first in function of the second?

Let us suppose that the explanation of the over-production of heat could not be found within a short time; is it conceivable that one should not try to exploit it all the same? If this had been the case in the past, man would still be in the Stone Age because, according to this way of thinking, he would only have exploited heat after having understood it first.

Why do the conservatives peremptorily ask for "the princeps test": neutron production? How can they be sure that behind the over-production of heat there is not an undiscovered phenomenon, which might not involve neutron production? What has become of the Galilean principle, according to which it is the observation of phenomena that must incite us to create mental models, and through experience these models must be continuously put to the test?

Furthermore, moving on to the other subject doomed to be ignored, what is one supposed to think when a certain physical phenomenon is first defined as *absurd*, then *contrary to experience*, and finally, in the same textbook, *impossible* in an early chapter, but *perhaps possible* in a final chapter, in which negative temperatures are concerned? If it is not totally impossible, why should the works concerning it be disregarded?

Who can arrogate himself the right to close his eyes when faced with something which is in contrast with the current theories, or with the theories he likes? Supposing that such scientists exist, what kind of interests would they place before those, pure, of science? The general impression one draws from the behavior of conservatives, in many sectors, is that their main concern is to deny legitimacy to *some* phenomena, which could lead to unlimited and free production of energy.

According to the ideas of a certain group of scientists, the only way to obtain an unlimited, "free" and "clean" energy, would be that of nuclear *hot fusion*, since this method works on paper and, *on paper*, is due to became operative in forty or fifty years, if everything goes the right way. The efforts which are made against cold fusion seem to be consistent with those made against the perfect thermodynamic engine, and it is not difficult to recognize the same fellows in both groups.

If this is the explanation, in the case of cold fusion the ruffled attitude of conservatives can be understood considering that the sensational announcement of the two electrochemists has set a series of research enterprises which cannot be so easily stopped. In the case of Yelin's engine, since it produces a power of about 10^{-10} W, it must be easy, for a certain mentality, to be persuaded that it implies a secondary, negligible phenomenon. Indeed, the Chinese announcement, even if exceptional, was not enough to arouse anybody's attention. But in this case, the action of conservatives finds a much more favorable ground, compared to other fields in which they want to operate.

I am convinced that, even if Yelin had produced a power of 10 W, he couldn't have succeeded in arousing attention, simply because nobody can believe that his engine could exist. I am sure that no journalist would have flown to China to interview him because nobody, not even a *scientific* journalist, can be free of mental conditioning. Indeed, scientific thought has denied the possibility that energy may be produced from heat without an associated waste for more than two centuries.

According to this interpretation of mine, it is possible to justify everybody's behavior, because an undetermined phe-

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nomenon which produces free energy but which seems to burn something may seem believable. On the contrary, a phenomenon which produces free energy but which, at first glance, does not burn anything seems totally beyond belief. I say *at first glance* because to sustain the second one (the PTE), nothing less than the Sun would be needed! Clearly, it is also a matter of culture.

The culture which emphasizes an undetermined nuclear fusion phenomenon is the same culture which neglects the production of energy without apparent combustion. How can this culture immediately understand that not even a perfect thermodynamic engine could go on running without the support of the energy coming from the Sun? If you like, even a PTE must be sustained by some kind of waste; and what a waste—all the energy which a star irradiates in all directions, which can maintain a temperature on the surface of a planet which is high enough to allow the PTE to work.

The cultural matter facilitates the action of conservatives who want to hamper studies on the PTE. Their task is extremely simple at present, because, not having any incentive as to this matter, they can simply overlook all those works which, directly or indirectly, are likely to question the state of the matter.

We could also make some conjectures on who those conservatives could be, and what reasons they might have to hold things back. These could be all those representatives of the scientific world, for which the credibility of their own class (of scientists) is very important. To have some idea of what the interests of this kind of conservative could be, let us bear in mind the loss of credibility which a science that for 150 years has declared a certain phenomenon impossible, risks suffering once it becomes clear that the elements to produce it were existent, but were not seen. And if this is true, what price has mankind paid, and will it go on paying as a result of this *oversight?* We will leave this arduous estimation to the next generation.

But I am inclined to think that this is not the main reason for the resistance. It could be one of the reasons, but it cannot be that strong, because even non-qualified people have gotten used to the continuous adjustments of the point of view of science, which very often consists of a complete change of course. Furthermore, particularly after the recent events in Eastern Europe, the concept that entire populations can be subjected to paying unimaginable bills for decades, as a consequence of the ideas of some caste of intellectuals, has been assimilated.

The true reason for the opposition must be more direct and specific, and I think it should be searched for among the reasons, ideal or material which, after the announcement of Fleischmann and Pons, induced some scientists engaged in research on nuclear hot fusion to declare their frustration. It is easy to understand the first kind of motivation. As regards the second, it should be pointed out that extremely large amounts of money have been spent for tens of years, in order to strive for a result which, little by little, has become more and more difficult to achieve in practice. If, all of a sudden, some fellows come forth having obtained an equivalent result by means of an inexpensive system, a whole sector of research *becomes afraid* of having its funding slashed.

But if such fear exists, it is not justified in my opinion, because it would be absurd for mankind to give up on such an important project from a practical and scientific point of view, renouncing it on the basis of economic reasons. Indeed, amounts of money as great as those mentioned before are every year spent on research of pure speculative interest. Who will prevent mankind from bringing a small piece of Sun to Earth, as one claims following the result recently achieved at the Culham Laboratory in England?

My interpretation, stated above, based upon the influence of culture combined with the presumed interests of conservatives, also gives a meaning to the behavior of the Chinese. Indeed, it is true that Yelin met some opposition from within but, in the end, apparently, he got the help of his Academy and the endorsement of the official Chinese press agency, things that in Western countries he could never have dreamed of obtaining, in my opinion. Why is all this possible in China? First of all owing to cultural issues, I think, probably combined with the fact that there are not such firmly established interests, which could justify the action of brakemen. In fact, the Chinese culture finds its roots in the Taoist philosophy. According to this philosophy, in all things two opposed elements (yin and yang) reciprocally interact and continuously alternate, in an endless metamorphosis, because the essence of things lies in the unity of opposites.[35]

> Before publishing his work, Yelin kept his equipment running continuously for one year, without ever finding signs of decrease in performance.

According to Taoistic thought, Nature follows spontaneous evolutions, which are continuous and cyclic, and not determined by external forces. Tao is the cosmic process which involves the whole universe. Furthermore, in the Confucian interpretation, one speaks also about Tao of man and of society. In order to remain in harmony with Nature, man should behave in such a way as to refrain from altering the spontaneous succession of events and keep his behavior spontaneous.

If we go back to consider Yelin's engine, we realize that it is perfectly consistent with this approach. The generation of electric current is spontaneous, energy transforms itself from one form to another one and continuously circulates, but no material visible body moves; Yelin's perfect engine has a double degree of perfection because it is also eternal. Whereas our thermal engines—since they burn matter, contaminate the air, waste heat, and destroy themselves—go against the natural course of things. For the Taoist culture, it must be quite difficult to accept the second principle of thermodynamics which, essentially, upholds an irreversible degradation of heat. Deep down, I think this idea must ring false with the Chinese. Whereas it is the basis of our society, where everything must be consumed and where everything must have a price.

I suppose that these must have been the reasons for which the Chinese announcement was confined for only one day to the eleventh page of a newspaper, while the one

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made by Fleischmann and Pons took up the front pages of newspapers for months.

Going back to the PTE with a real gas described in this book, the reader will have certainly noticed that among the things I have mentioned on this subject, there is no new element, no discovery of new phenomena, and no new invention has been presented. Indeed, the Ericsson cycle was invented by John Ericsson in 1833, complete with regenerator, the invention of which is instead attributed to Robert Stirling; the experiments and the equations of state of real fluids were elaborated by the National Bureau of Standards and analogous scientific institutions, while the idea of pairing two engines with different efficiency comes from Carnot no less.

The only new element which may be considered as introduced by me here is the one concerning the formalization of the theorems on Stirling and Ericsson cycles with real gas. But, in essence, they were already known. Indeed, it is known in thermodynamics that Stirling and Ericsson cycles with an *ideal* gas have the same efficiency as the corresponding Carnot cycle, but only if they make use of a perfect heat recuperator. Therefore, the only element of novelty introduced in this book lies in putting together known notions. In the part in which the genesis of the PTE is described, a simple mental construction has been made, like the one that an engineer could make if he had frictionless devices and heat recuperators with no kind of loss available and who, on the basis of the first principle of thermodynamics, would calculate the efficiency of cycles.

Undoubtedly it is very difficult to believe that what I have described here could really be achieved, because believing this is equivalent to believing that our culture has developed, over the last two centuries, on the basis of wrong assumptions. For this reason I consider it unlikely that in Western countries research in the new direction will be undertaken, in the short run. I hope that the same will not happen in Eastern countries.

The second principle of thermodynamics was born with a peculiarity: it is the principle of impossibility *for mankind*. From this point of view the principle is undoubtedly true, because it really is impossible for mankind to find what it does not want to look for.

References

We have reprinted the reference list for the entire book with this section; please note that there is some misnumbering and apparent missing references from the original.

1. Finkelstein, T. 1959. "Air Engines," *Engineer,* 207, 492-497, 522-527, 568-571, 720-723.
2. Truesdell, C. *Rational Thermodynamics,* McGraw Inc.
3. Truesdell, C. and Bharatha, S. 1977. *The Concepts and Logic of Classical Thermodynamics as a Theory of Heat Engines,* Springer-Verlag.
4. Truesdell, C. 1980. *The Tragicomical History of Thermodymamics, 1822-1854,* Springer-Verlag.
5. Reech, M.F. 1853. "Théorie générale des effects dynamiques de la chaleur," *Journal de Mathématiques Pures et Appliquées,* 18, 357-568.
6. Carnot, S. 1824. *Réflexions sur la Puissance Motrice du Feu et sur les Machines Propres a Développer cette Puissance,* Paris, chez Bachelier, Libraire.
7. Fox, R. 1978. *Sadi Carnot Réflexions sur la Puissance Motrice du Feu: Edition Critique avec Introduction et Commentaire, augmentee de documents d'archives et de divers manuscript de Carnot,* Paris, Librairie Philosophique J. Vrin.
8. Joule, J.P. 1963. *The Scientific Papers of James Prescott Joule* (1877), Vol. I - II, Reprinted in London by Dawsons of Pall Mall.
9. Thomson, W. 1849. "On an Absolute Thermometric Scale Founded on Carnot's Theory of the Motive Power of Heat, and Calculated from Regnault's Observations," *Proceedings of the Cambridge Philosophical Society,* 1, (1843/1863),5, 66-71; *Philosophical Magazine,* 3, 22, 313-317; pp. 100-106 of W. Thomson's *Mathematical and Physical Papers,* Vol. 1, (1882); Opere di Kelvin, by Enrico Bellone, UTET, 1971.
10. Thomson, W. 1848. "An Account of Carnot's Theory of the Motive Power of Heat; With Numerical Results Deduced from Regnault's Experiments on Steam," *Transaction of the Royal Society of Edinburgh,* 16, pp. 541-574.
11. Clausius, R. 1850. "Über die bewegende Kraft der Warme und die Gesetze, welche sich daraus fur die Wärmelehre selbst ableiten lassen," *Annalen der Psysik und Chemie*; 1851. "On the Moving Force of Heat, and the Laws Regarding the Nature of Heat Itself Which are Deducible Therefrom," *Philosophical Magazine,* 4, 2, 1-21, 102-119.
12. Thomson, W. 1851. "On the Dynamical Theory of Heat, with Numerical Results Deduced from Mr. Joule's Equivalent of Thermal Unit, and M. Regnault's Observations on Steam," Parts I-III, Transactions of the Royal Society of Edinburgh, 1850-1853. 20,
13. Joule, J.P. and Thomson, W. 1854. "On the Thermal Effects of Fluids in Motion," Part II, *Philosofical Transactions of the Royal Society,* 144, pp. 321-364.
14. Clausius, R. 1856. "On a Modified Form of the Second Fundamental Theorem in the Mechanical Theory of Heat," *Philosofical Magazine,* 4, 12, 81-98.
15. Clausius, R. 1865. *IX Memoir,* "On Different Forms of the Fundamental Equations of the Mechanical Theory of Heat and Their Convenience for Application," pp. 162-193 from *The Second Law of Thermodynamics,* ed. J. Kestin, Stroudsburg (Pa), Dowden, Huchinson and Ross (1976).
16. Maxwell, J.C. *XCI Memoir,* "Tait's Thermodynamics," from *The Scientific Papers of James Clerk Maxwell,* ed. W.D. Niven, MA., ER.S., Paris, Librairie Scientifique J. Hermann, 2, pp. 660-671.
17. Pauli, W. 1964. *Meccanica Statistica,* Boringhieri, 15.
18. Carathéodory, C. 1909. "Investigations into the Foundations of Thermodynamics," from *The Second Law of Thermodynamics,* Dowden, Hutchinson and Ross, 1976.
19. Zemansky, M. 1957. *Heat and Thermodynamics,* McGraw-Hill Book Co.

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About the Author

Maurizio Vignati received his bachelor's degree in physics (nuclear specialization) in 1968 and completed a thesis on the "Development of a Streamer Chamber." After teaching mathematics and physics for two years, he was employed at the National Agency for Accidents Protection and worked for twelve years in research and control, dealing with ionizing and non-ionizing radiations. He then worked at the Institute for Labor Accident Prevention and Safety (ISPESL), supervised by the Ministry of Health, dealing with problems related to prevention and safety regarding radiations and non-ionizing radiations. University studies led Vignati to believe that water tension properties defied the second principle of thermodynamics. He set up a simple thermodynamics experiment and the result, although not conclusive, reinforced his doubts about the general validity of the second principle and encouraged him to work towards developing a thermodynamic system that could produce better effects. Vignati holds fifteen patents on industrial inventions. He is still employed with ISPESL.

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A Trial and Study on Obtaining Energy from a Single Heat Reservoir at Ambient Temperature

Xu Yelin*

Summary

This is a research report concerned with how to "obtain energy from a single heat reservoir at ambient temperature." The key points for solving such a problem are the design and techniques for constructing a novel diode, characteristically in one-direction conductance without bias voltage and circuit, such that a steady and continuous current should be generated as soon as the two ends of the diode were connected with a wire. The working principles and technology for constructing such a diode and the experimental results are interpreted in detail in this book.

In the appendix, the author suggests a new hypothesis on "energy circulation" and discusses thoroughly the possible reasons concerning the energy upgrading in his interesting experiments. This book is appropriate to physicists.

Foreword

In May of 1986, the author made in the laboratory a novel diode which shows its specific one-direction electric conductance without any bias voltage.[1] As soon as the ends of the diode were connected with a wire, a continuous and steady current with load could be observed. Since then, the experiment had been continued for 8,760 hours, and was ended in May of the next year with good reliability and reproducibility. Under an ambient temperature of 32°C, this facility produced the critical data: short circuit output current (DC) was 5.3 x 10^{-8} A, output voltage (DC) at 100 MΩ resistance load was 55 mV. Although this facility can not be utilized in practice right now, its applicable potential is quite promising.

The energy source of this facility, as dealt with in the appendix of this report, comes from the speed reduction of the high-speed thermal electrons of the electrode. A theorem concerning this phenomenon shows no contradiction to the Entropy Increase Principle, Clausius' statement and Kelvin's statement on the second law of thermodynamics. However, it contradicts another statement of Kelvin's and Planck's statement of the second law.

The author is indebted to many individuals for their assistance and encouragement. Special thanks are owed to Prof. Song Xinqi (Tsinghua University), Prof. Gao Zhiwei (Institute of High Energy Physics, Academia Sinica), and Prof. Chen Chongguang (Graduate School, Academia Sinica) for their comments and suggestions. The author also thanks Prof. Nie Chonghou (Editorial Committee of Scientia Sinica) for her careful revision of the English text. (Book printed in 1988 by Science Press, Beijing, China.)

1. General Consideration of the Nonbias Diode

A nonbias diode is a diode that can perform one-directional conductivity without any bias circuit or voltage. As soon as both ends of the diode are connected with a wire, a continuous and steady current I_T originated from the thermal motion of the free electrons in the conductor will flow through the wire (Figure 1-1(a)).

When the resistance of the circuit is zero, no work will be done by the current. When a resistance R_T is connected in series, an end voltage across the diode D_T, I_TR_T (Figure 1-1(b)) will be formed. Here A is the anode of the diode, C is the cathode. Then the electric field E_1 presented in the diode is

$$E_1 = I_TR_T/d \tag{1-1}$$

where d is the distance between the two poles of the diode. The direction of the field is shown in the figure. Since D_T is a nonbias diode, it permits electrons to flow from cathode C to anode A. The reversed process is strongly forbidden. The cathodic electrons are affected by a speed degraded force eE_1, in their motion from C to A, for eliminating the force a work done w_1 is

$$w_1 = eE_1d = e(I_TR_T/d)d = e(I_TR_T) \tag{1-2}$$

Assume that n_1 electrons reach A from C in a unit time, the overall energy loss W_1 will be

$$W_1 = n_1w_1 = n_1eI_TR_T \tag{1-3}$$

Let n_1e be the unit of electricity, then

$$W_1 = I_T^2R_T \tag{1-4}$$

The electrons with lower primary speed, which is insufficient to surpass the speed degradation force exerted by the electric field E_1, are not able to reach anode A. Obviously, the escaped cathodic electrons are those with higher energy, therefore the cathode temperature has to be depressed. Let Q_3 be the corresponding heat loss in the same units as that of work W_1

$$Q_3 = W_1 \tag{1-5}$$

As known from Equation *(1-2), the excess energy of the higher speed thermal cathodic electrons can be drawn out by the D_T, and converted into macroscopic electric power (Equation 1-4). It is quite notable that such a process can be performed with only a single heat reservoir. This is the specific character of a diode D_T regardless of its construction.* For simplicity, the above statement is called the *"D_T theorem."*

It is difficult to prove a process to be one that extracts

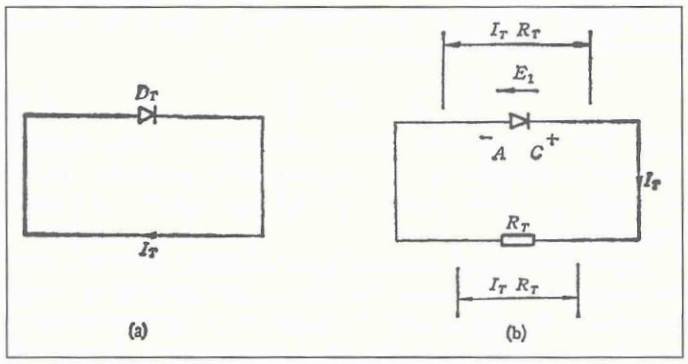

Figure 1-1. D_T diode.

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energy from a single heat reservoir. However, to predict its specific conductivity as nonbias and one-directional is easy. Consequently, the "D_T theorem" may be used as a criterion for the nature of the process. For instance, we can predict, if a facility shows its specific conductivity as nonbias and one-directional, that it must have the ability to extract energy from a single heat reservoir and vice versa. That is, nonbias one-directional conductivity is synonymous with drawing energy from one single heat reservoir.

It should be noted that the "D_T theorem" is employed under the condition of thorough elimination of all possible perturbations, such as a sudden fluctuation of the environment temperature, external radiation, and alternating field, which may interfere with the digital I_T. Therefore, excellent anti-perturbation measures are necessary. For detecting the validity of all the measures used, the interference current created by various factors has to be identified individually by the following criterion,

$$\sum_i |I_{Ti}| \ll |I_T| \tag{1-6}$$

where i denotes any perturbation to be considered. In other words, the "D_T theorem" can be utilized only when Equation 1-6 is satisfied by the facility used.

Originally, the temperatures of the electrodes of the D_T diode, load resistance R_T, and environment are the same. However, a temperature difference between its cathode and anode is caused by the thermal free electron escape in the diode, and it is unfavorable for the generation of I_T. The temperature difference of the D_T diode is generated from the thermal motion of electrons, instead of any external work. In other words, the temperature difference results in the energy being drawn from one single heat reservoir, and the reverse process is unavailable.

2. The Working Principle of the Nonbias Diode

Ordinary electric tubes, photocells, and transistors have no characteristics of nonbias one-directional conductance. The nonbias diode has to be redesigned on account of its working principle.

We have conducting bodies A, C (Figure 2-1(a)) with different work functions $e\varphi$. When contacting, a contact voltage difference ΔV_{AC} exists between A and C

$$\Delta V_{AC} = (\varphi_C - \varphi_A) \tag{2-1}$$

as $\varphi_A < \varphi_C$, A will be positive and C will be negative.

When two pieces of conductor are fabricated in the form shown in Figure 2-1(b), the seam will be charged with the same polarity. The amount of the charge carried by each electrode is equal to the capacity between the electrodes multiplied by ΔV_{AC}. Then the electric field E_2 formed between the electrodes becomes

$$E_2 = (\varphi_c - \varphi_A) / d \tag{2-2}$$

This field is the result of the equilibrium of the thermal motion of electrons in the electrodes. The electrodes shown in Figure 2-1(b) are sealed in a vacuum tube as shown in Figure 2-1(c).

Difference of work function $e\varphi$ is the first condition needed for generating current. The other condition that has to be satisfied is the ability of both electrodes to emit electrons at ambient temperature. Under these circumstances, there exist two electron flows, one from anode A as e_A, the other e_c from cathode C

$$e_A = k_A S_A T^2 e^{-\frac{e\varphi_A}{KT}} \tag{2-3}$$

$$e_C = k_C S_C T^2 e^{-\frac{e\varphi_C}{KT}} \tag{2-4}$$

where S_A, S_c refer to emitting surfaces of these two electrodes respectively, k is the emitting constant, K is the Boltzmann constant, and T is the absolute temperature. In this case, both electrodes are similar in material, and at the same working temperature, so that $k_A \approx k_C$. The distribution of electron energy is shown in Figure 2-1(d), where the abscissa refers to the energy of electrons, the ordinate the number of electrons. Since $\varphi_A < \varphi_C$ the above equation may be rewritten as

$$e_A = k_1(S_1+S_2)S_A \tag{2-5}$$

$$e_c = k_1 S_2 S_C \tag{2-6}$$

In consequence of the acceleration by field E_2 to the electrons emitted from the cathode C, they can reach the anode A. Conversely, the electrons in area S_1 cannot reach cathode C, because of the reduction of speed by the field E_2. As only the electrons corresponding to area S_2 reach the cathode C, Equation 2-3 becomes

$$e_A = k_C S_A T^2 e^{-\frac{e\varphi_C}{KT}} \tag{2-7}$$

These electron flows are opposite in direction and their difference is the current I'_T

$$I'_T = -(e_C - e_A) = -k_C T^2 e^{-\frac{e\varphi_C}{KT}} (S_C - S_A) \tag{2-8}$$

For a D_T diode constructed in a parallel-plate condenser, when $S_A = S_C$, we have

$$I'_T = 0 \tag{2-9}$$

It is consistent with the experimental result 8 listed in Table 5-1.

As anode A is made into a thin wire electrode, cathode C

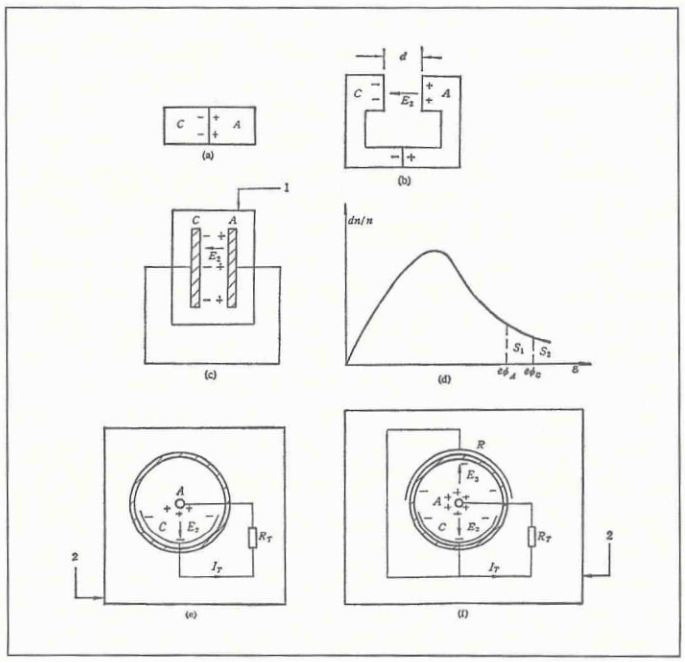

Figure 2-1. Working principle of D_T diode. 1: vacuum tube; 2: radiation and electric screen.

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into a half cylindrical tube (Figure 2-1(e)), when $S_C >> S_A$ we have

$$I_T' \approx -k_C S_C T^2 e^{-\frac{e\varphi_C}{KT}} \qquad (2\text{-}10)$$

According to the "half cubic law" of diode, the current I_T'' can be observed as

$$I_T'' = -k_C S_C T^2 e^{-\frac{e\varphi_C}{KT}} \left(\frac{\varphi_C - \varphi_A}{V_0}\right)^{3/2} \qquad (2\text{-}11)$$

where V_0 is the saturation voltage, as $(\varphi_C - \varphi_A) << V_0$, I_T'' is quite small.

In order to amplify the current I_T'', an auxiliary electrode R was connected outside the tube shell, opposite to the cathode (Figure 2-1(f)). The work function of this electrode is as high as $\varphi_R >> \varphi_C$. As soon as the auxiliary electrode R is connected to cathode C, R will be negatively charged due to the contact voltage difference, an auxiliary field E_3 will be resulted, and $E_1 >> E_2$. Let η be the percentage of electrons which can reach the upper part of the tube from the lower part, then the current I_T becomes

$$I_T = -k_C S_C T^2 e^{-\frac{e\varphi_C}{KT}} \left[\left(\frac{\varphi_C - \varphi_A}{V_0}\right)^{3/2} + \eta\left(\frac{\varphi_R - \varphi_A}{V_0}\right)^{3/2}\right] \qquad (2\text{-}12)$$

As $(\varphi_R - \varphi_A) >> (\varphi_C - \varphi_A)$, then $I_T >> I_T''$ where I_T is exactly the current we want to examine.

There is no current between auxiliary electrode R and the cathode or the anode, because electrode R cannot emit electrons under ambient temperature. The auxiliary electrode does not join in the exchange of energy, it merely functions as a funnel for collecting electrons.

3. Fabrication of Experimental Facilities

The key device of the experimental facilities is the D_T diode with its construction shown in Figure 3-1. With a glass outer shell, cathode C is made of a silver layer plated on the inner wall of the tube. Anode is made of a nickel wire ring, 0.2 mm in diameter for the wire, 8 x 16 mm in size. Connected with a vacuum system, the prefabricated device is subjected to degassing, vacuuming, oxidizing, adding cesium, and filling with argon. Then a tube needed is formed. The work function $e\varphi$ of the electrode depends not only on the material used but also the technology of fabrication. The gas tubes made with the above method may fit the requirements that $\varphi_A < \varphi_C$ and both electrodes can emit electrons without radiation. Those tubes which failed to fulfill this requirement should be discarded. (Some discarded tubes with $\varphi_A > \varphi_C$ the diode current could be detectable also, the direction is in the opposite of that cited above, but it is small and is neglected in this report.)

The qualified tubes, a copper foil auxiliary electrode was adhered on its outer surface with epoxy resins at 2 mm distance off the edge of the cathode.

The auxiliary electrode R was connected with the cathode C, D_T diodes were connected in parallel (Figure 3-2). In order to avoid bad contact, all the connection joints have to be soldered instead of plug connections. The facility was put into a black thick iron box with a drying agent (silicagel). The box was sealed with an adhesive tape, the wire hole was sealed with epoxy resin (Figure 3-3).

4. Experimental Results

One of the galvanometers used in this experiment is type MGF5 (Germany), another is type AC15/1 (China). They show the same results. The MGF5 galvanometer has a full scale of 100 divisions, each referring to a 5.8 x 10^{-11} A, with inner resistance 18.6kΩ. The scale of the AC15/1 contains 60 divisions each referring to 3 x 10^{-10} A with an internal resistance 1.5 kΩ. The measurement results are given below.

(A) Enable Characteristic

In order to stabilize the facility, it was, before use, con-

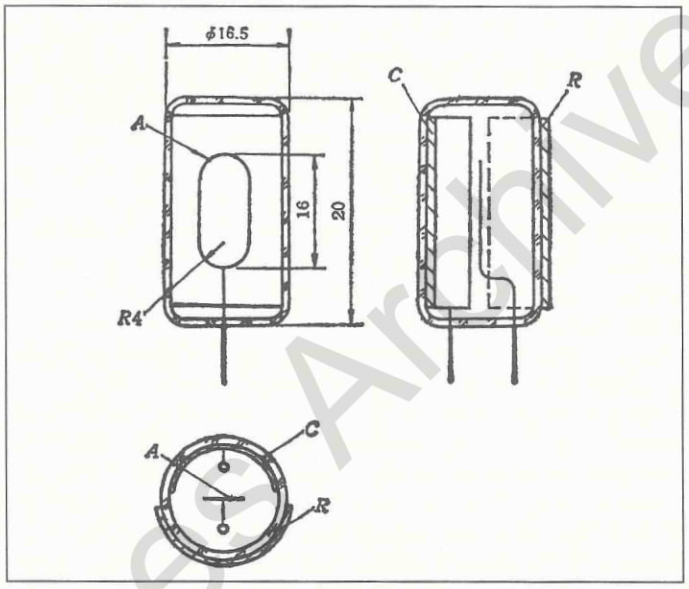

Figure 3-1. Construction of D_T diode. A: anode; C: cathode; R: auxiliary electrode.

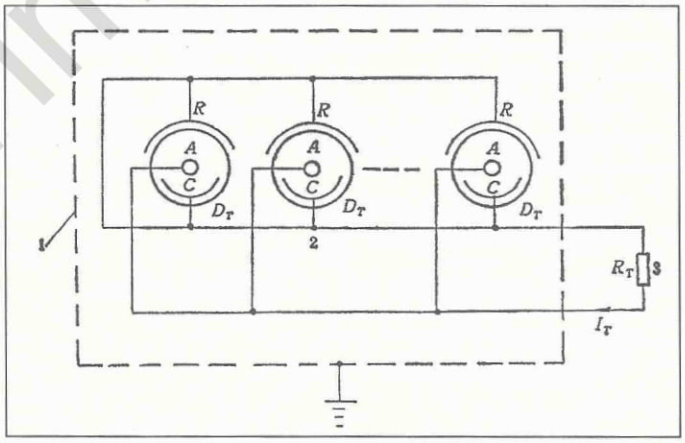

Figure 3-2. Electric principle of experimental facility. 1: radiation and electric screen; 2: 694 pieces of D_T diodes in parallel connection; 3: load resistance.

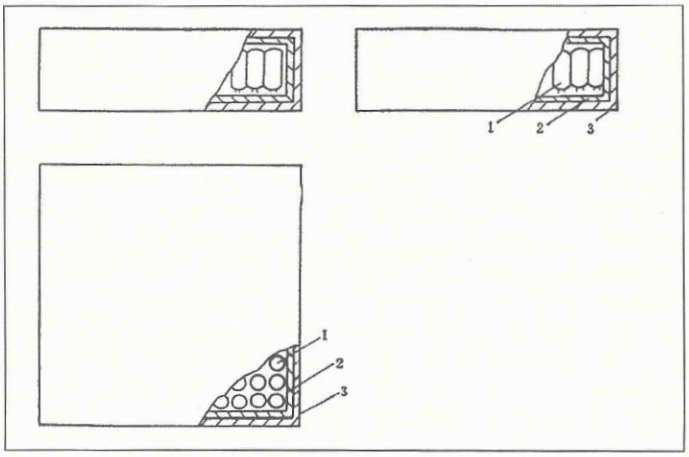

Figure 3-3. Construction of experimental facility. 1: D_T diode; 2: the radiation shielding layer; 3: the iron box.

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nected with galvanometer to discharge for one month, and stopped for one week until the overall experiment. The results obtained are plotted in Figure 4-1. The abscissa refers to time (in minutes), the ordinate the current I_T (in divisions, each equivalent to 3 x 10^{-10} A). The reading value is larger on the first two days, and afterwards it depends only on temperature as it varies with time. The start point in the curve is denoted as the critical data at the temperature given. Table 4-1 shows the critical data at 32°C.

(B) Continuity of Work

The facility discharges continuously for galvanometer for one year, *i.e.* 8,760 h. The data are listed in Figure 4-2. The abscissa refers to time (in months), the left ordinate refers to current (in divisions, each corresponding to 5.8 x 10^{-11} A and the right ordinate refers to the corresponding environment temperature (in °C). The experiment began in May 1986, the observed current paralleled with the climate temperature reaching its maximum in July and August. In early November, the room temperature dropped to the lowest as 11.5°C, and the reading declined to the minimum (8.5 divisions). It rose as soon as heat was supplied for the laboratory. Afterwards, it gradually decreased in accordance with the climate temperature outside the laboratory. Thus a concave-shaped curve was formed with its minimum being on about the tenth of January—the coldest day in a year. Evidently, the variation in the current reading is closely correlated with the variation in the season's temperature. It should be noted that the readings in May 1987 were the same as those recorded in May 1986.

During all seasons in a year, day and night, the reading of I_T depends only on the temperature that the facility experienced, regardless of season, weather, and time.

The maximum in the curve corresponds to the environment temperature at 27°C, 42 divisions on the galvanometer are correlated to:

voltage without load (D.C.) 5.9 mV,
short circuit current (D.C.) 2.5 x 10^{-9} A,

When the load resistance was 3.5 MΩ, they were

output (D.C.) voltage 3.1 mV,
output (D.C.) current 0.9 x 10^{-9} A.

(C) Resumption

After continuous operation for one year, the facility stopped, resuming to the original reading of the current as shown by the curve in Figure 4-3, where the abscissa refers to the time (in minutes), the ordinate the current readings (in divisions, each corresponding to 3 x 10^{-10} A).

(D) Temperature Characteristics of the Facility

In addition to the indication on temperature in (B), a specific discussion is made.

From Equation 2-12 we can see that the logarithm of current I_T is linearly related with the reciprocal of the environmental temperature.

In order to prove this relation, the facility and galvanometer were put in a thermostat. The results at varying temperatures were plotted in Figure 4-4. The abscissa refers to the reciprocal of the environmental temperature (divided by 300), the ordinate refers to current readings (in divisions, each corresponding to 5.8 x 10^{-11} A). Apparently, the experimental results are in agreement with our theoretical analysis.

(E) The Relation Between Number of Tubes and Enviromental Temperature.

Letting P be the number of the D_T diodes connected in parallel, Equation 2-12 becomes

$$I_T = -k_C S_C T^2 P e^{-\frac{e\varphi_C}{kT}}\left[\left(\frac{\varphi_C - \varphi_A}{V_0}\right)^{3/2} + \eta\left(\frac{\varphi_R - \varphi_A}{V_0}\right)^{3/2}\right] \quad (4\text{-}1)$$

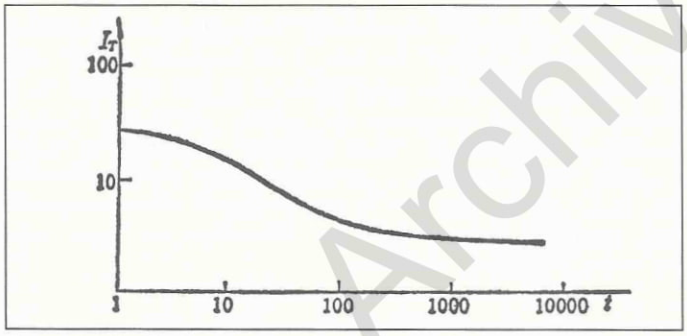

Figure 4-1. Enable characteristic of experimental facility. *t*: time (in minutes); I_T: current I_t, in divisions, each equivalent to 3 x 10^{-10} A Envir. Temp. 21°C.

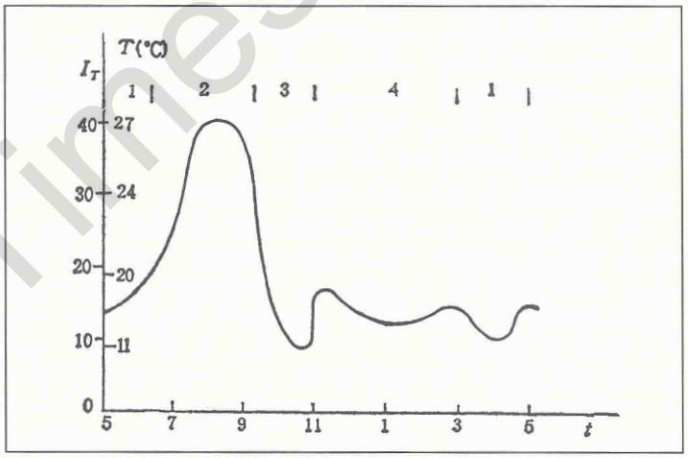

Figure 4-2. The continuity of working characteristics. *t*: time (in months); I_T: current I_T, in divisions, each equivalent to 5.8 x 10^{-11} A; *T*: Envir. Temp. (°C); 1: spring; 2: summer; 3: autumn; 4: winter.

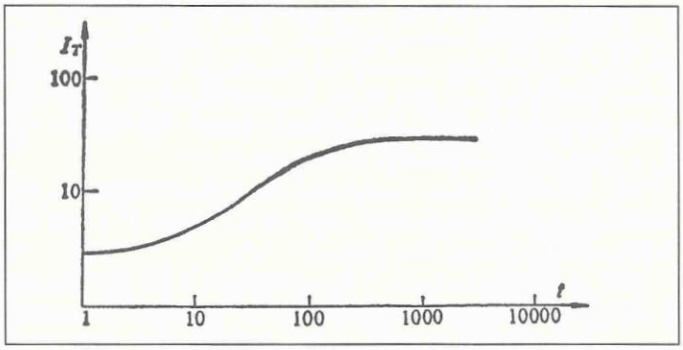

Figure 4-3. Resumption. *t*: Time (in minutes): I_T: Current I_T, in divisions, each equivalent to 3 x 10^{-10} A Envir. Temp. 21°C.

Table 4-1 Critical Data at 32°C

Envin. Temp.	Short Circuit Current	Load Voltage	Load Resistance
32°C	5.3 × 10^{-8} A	55 mV	100 MΩ

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Therefore, ln (PT^2) should correlate linearly to $1/T$. In this experiment, keeping the current I_T constant (30 divisions), we found variations in the number of the diodes connected in parallel and in the environmental temperature as shown in Figure 4-5. It is seen from the curve that the experimental results are consistent with our theoretical analysis.

5. Anti-perturbation Test

Both the currents of comparison experiment and the currents caused by ordinary perturbation are included in I_{Ti} in Equation 1-6. Let's first examine perturbation.

1) The electrical shielding of the facility used is perfect. Experiments show that both alternative electric and magnetic fields exert no influence on the facility. It was recorded that $I_{T1}= 0$, therefore, the generation of I_T by any external alternating electric and magnetic field can be excluded.

2) No effect was given by static fields of electric and magnetic and nuclear radiation to I_T. $I_{T2} = 0$ was recorded.

3) The screening of the facility is perfect, so that I_T cannot be generated by any light leak. Practically, $I_{T3} = 0$.

4) By means of a photocell in the screened iron box, neither phosphor nor other radiators were discovered. Practically, $I_{T4} = 0$.

The photocell used has the same spectrum-response as the D_T diode with its sensitivity 10^6 times greater than that of the D_T diode. So the detection is reliable.

5) Perturbation caused by the fluctuation of the environmental temperature.

Fluctuation of temperature in our environment is persistent. It affects I_T in two cases.

In the first case, temperature varies so slowly that we consider the environment as a uniform heat reservoir in slow variation. The character of I_T caused by environmental temperature is correlated to T, and following T, I_T can thus exist for a long period. Evidently, the current I_T should not be included in perturbation.

In the second case, the environmental temperature changes so rapidly that the cathode and anode are heated separately. I_T will be raised when the temperature of the cathode is higher than that of the anode, and vice versa. The I_T caused by this factor depends on the speed of variation in temperature, but it is independent of the magnitude of the temperature. The current appears only in a short time. It has to be included in I_{T5}.

Therefore depression of the rate of temperature variation serves as a main channel for eliminating the perturbation on the facility. The procedures are given as follows.

In order to take an average of the temperature gradients in the room and smooth the temperature variations, some effective steps such as using enough number of diodes connected in parallel, setting the facility in the corner off the door and window in a room on the first floor of the building were taken.

After adopting these measures, the room temperature and I_T were measured in the ordinary weather of spring, summer, and autumn as plotted in Figure 5-1. The abscissa refers to time (in h), the left ordinate refers to temperature (in °C), the right one refers to current (in divisions). The interval of environmental temperature variation τ_T is about 5h, the fluctuation of temperature is ±0.35°C, and the corresponding current variation is ±0.6 division. Since that time constant of

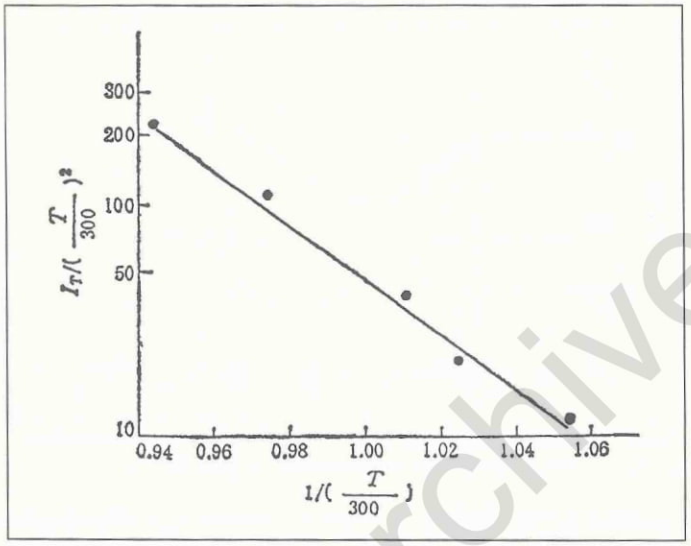

Figure 4-4. Temperature characteristics of the facility. $I_T/(\frac{T}{300})^2$: Current I_T, in divisions, each equivalent to 5.8×10^{-11} A; T: absolute temperature (K).

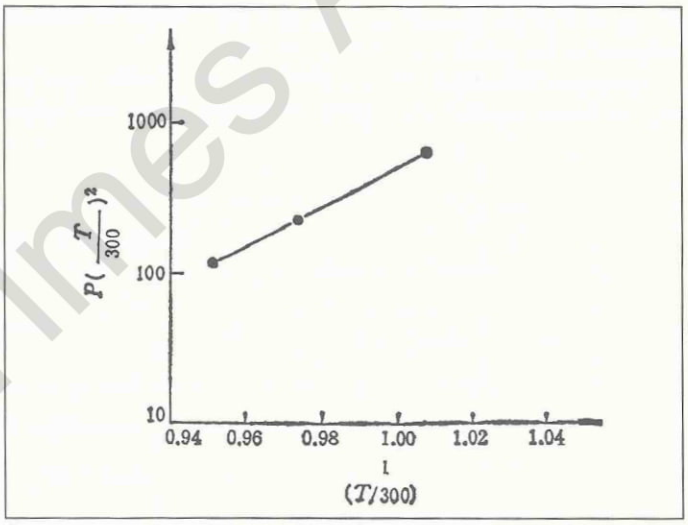

Figure 4-5. Relation between number of tubes and environmental temperature. P: Number of tubes; T: environmental temperature (K).

heat transfer for the facility τ_1 is 1.5h and $\tau_T >> \tau_1$, I_T can catch up the slight temperature fluctuation (Figure 5-1). Moreover, the variation of temperature in the seasons is much slower, the relation of I_T — T will always hold up (Figure 4-2). So the I_T fluctuation observed should not be considered as I_{T5}, *i.e.* $I_{T5} = 0$.

Another influence may occur in abnormal weather, and $I_{T5} \neq 0$. Therefore, this influence has to be avoided. In our long-term continuous observation, the readings were recorded but not employed.

Let us consider here the experiments for comparison, 700 pieces each of the following devices were connected in parallel and the current I_T generated under the same conditions was observed. The results are summarized in Table 5-1.

Obviously, the occurrence of current I_T originates from neither perturbation nor plug in units. In other words, the D_T theorem is appropriate to the facility used in the experiment.

Appendix

Working principles (see 2) indicates that the facility used is a nonbias diode. Anti-perturbation character (see 5) indicates that the requirements of Equation 1-6 can be

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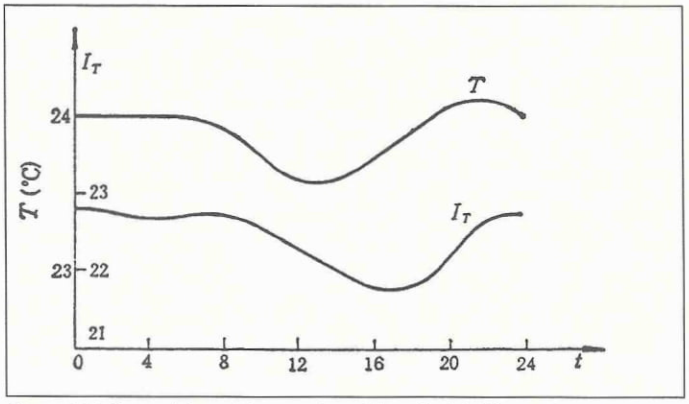

Figure 5-1. Current I_T and temperature t: time (in h); T: room temperature (°C); I_T: current I_T, in divisions, each equivalent to 5.8 x 10^{-11} A.

fulfilled by the facility, and the D_T theorem is appropriate to the phenomena observed in this experiment. Let us discuss it further.

1. Energy Circulation

Let us further discuss the origin of the current in consideration of the structure of the D_T diode.

Assume that there is an electron of kinetic energy w_2. It loses energy $e\varphi_c$ when escaping from the cathode. Accelerated by an electric field E_2, its energy gain will be $\int_C^A eE_2 dr = e(\varphi_C - \varphi_A)$, an energy gain $e\varphi_A$ is then obtained when entering the anode A. Letting that energy of that instant be w_3, we obtain

$$w_3 = w_2 - e\varphi_C + \int_C^A eE_2 dr + e\varphi_A = w_2 \qquad \text{(1-a)}$$

that is, the net energy of the electron going through the above process remains constant at the condition $R_T = 0$.

When $R_T \neq 0$, electrons are in excess at the anode and in deficiency at the cathode. Thus an additional electric field E_1 is formed.

Then the original field E_2 may be reduced to E_4 by the action of E_1 and

$$E_1 = E_2 - E_4 \qquad \text{(1-b)}$$

At that time, the energy w_2 of the electron will be w_4 when it moves across the field E_4, and w_4 will be

$$w_4 = w_2 - e\varphi_C + \int_C^A eE_4 dr + e\varphi_A \qquad \text{(1-c)}$$

Table 5-1 I_{Tj} measured at 24°C

Type of Experiment	No.	Perturbation and Device	No. of Devices parallelly connected	I_{Tj}
Anti-perturbation	1	Alternating electric and magnetic fields		0
	2	Static electric/magnetic fields, radiation		0
	3	External radiation		0
	4	Phosphors in box		0
	5	Fluctuations of environment temp.		0
For comparison	6	Type GD-21 photoelement	700	≈ 0
	7	Common photoelement	700	0
	8	Parallel type photoelement	700	0
	9	Type N6m IR image tube	700	0
	10	Various thermocouples	700	0
	11	Various electronic tubes	700	0
	12	Various transistors	700	0
	13	Various resistors	700	0
	14	Various photo-cells	700	0
		$\sum_{j=1-14} \lvert I_{Tj} \rvert$		≈ 0

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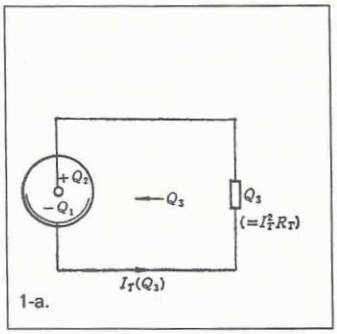


Figure 1-a.
Energy circulation diagram.

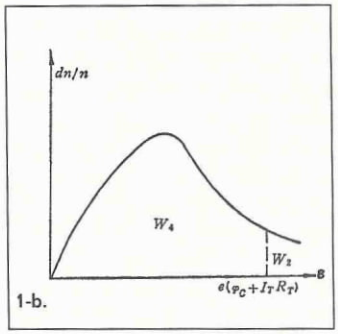
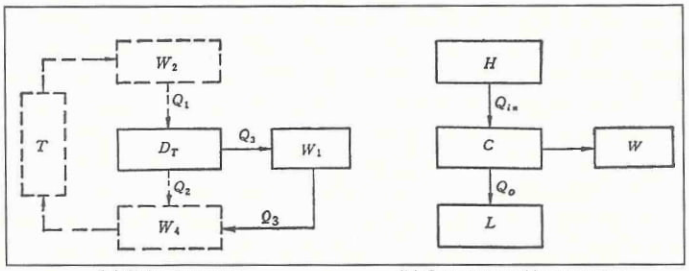


Figure 1-b.
Two heat reservoirs in energy space.



(a) D_T heat engine (b) Conventional heat engine

Figure 1-c. Two kinds of heat engine. T: thermal motion W_2; or H: high temperature heat reservoir W_4; or L: low temperature heat reservoir; D_T: D_T heat engine; C: conventional heat engine; Dashed line: energy space; Solid line: geometrical space

The energy loss of the electron is w_1

$$w_1 = w_2 - w_4 \tag{1-d}$$

$$w_1 = w_3 - w_4 = e\int_C^A E_1 dr = e(I_T R_T) \tag{1-e}$$

$$n_1 w_1 = I_T^2 R_T \tag{1-f}$$

That is, when an electron of kinetic energy w_2 escapes from the cathode, moves through the electric field, and reaches the anode, the energy loss $(w_2 - w_4)$ may convert into electric power $I_T^2 R_T$. This conclusion is consistent with Equations 1-2 and 1-4.

Let $\overline{W}_2$ be the average kinetic energy of the electrons traveling from the cathode towards the anode, $\overline{W}_4$ be their average kinetic energy as soon as they have reached the anode, and $\overline{W}_0$ be the average kinetic energy of an electron at an ambient temperature, then, the energy loss of the cathode in unit time is Q_1

$$Q_1 = n_1(\overline{W}_2 - \overline{W}_0) \tag{1-g}$$

the energy gain of the anode in unit time Q_2

$$Q_2 = n_1(\overline{W}_4 - \overline{W}_0) \tag{1-h}$$

and the energy output by the experiment facility in unit time is Q_3

$$Q_3 = Q_1 - Q_2 \tag{1-i}$$

$$Q_3 = n_1(\overline{w}_1 - \overline{w}_4) = n_1 w_1 = I_T^2 R_T \tag{1-j}$$

i.e. the output energy Q_3 is converted into electric power $I_T^2 R_T$. In this way, an energy circulation diagram can be plotted as Figure 1-a, where the positive sign means the energy gain and the negative sign the energy loss. The circulating process consists of the cathode losing energy Q_1, the anode gaining energy Q_2, $Q_1 - Q_2 = Q_3$ converted into resistance heat at the load, and transported to the surroundings, which in turn passed to the facility again. All these processes form naturally an energy circulation.

Let us collect all the electrons of energy w_2, and imagine them as high-temperature heat reservoir W_2, the electrons of energy w_4 as a low-temperature heat reservoir W_4 (Figure 1-b). The two reservoirs are separated in the energy space by $e(\varphi_c + I_T R_T)$, however, they are homogeneously mixed in the geometrical space. High-speed electrons provided by W_2 flow continuously to W_4 and convert into electrons of low speed. Therefore, the existence of two reservoirs W_2 and W_4 is a necessary condition for energy gain.

We can assume the energy gain process of our facility is equivalent to the working process of a heat engine (Figure 1-c). Therefore, the D_T heat engine is another necessary condition for obtaining energy.

In summary, "energy circulation" refers to that energy which can be obtained from two heat reservoirs in energy space (a single heat reservoir in geometrical space) by means of a D_T heat engine, and converted completely into work without any influence. Therefore, the energy may be repeatedly used by circulation without any degradation.

2. Relation Between the Second Law of Thermodynamics and the Results Reported

A) Our result does obey the Entropy Increase Principle.

The principle of entropy increase is "the entropy in an isolated system will never be decreased." The temperature of this facility is depressed as far as it outputs electric power, thus the entropy is decreased in the meantime. But it is not an isolated system, therefore it is not contradictory to the Entropy Increase Principle.

Combining the facility and load resistance into an isolated system, the entropy of the system remains constant since $Q_1 - Q_2 = Q_3$ (Equation (1-i)). It shows no contradiction to the Entropy Increase Principle.

Obviously, our result does obey the Entropy Increase Principle.

B) Our result does obey Clausius' statement of the Second Law of Thermodynamics.

Clausius' statement is that it is not possible to transfer heat from a low-temperature body to a high-temperature body without any change.

In this experiment, the cathode C is a low-temperature body, and the anode is a high-temperature one. The process of high-speed electrons continuously emitted by cathode C to A is a process of heat transer from a low-temperature body to a high-temperature body.

The facility also acts as a low-temperature body, and the load in the circuit is a high-temperature body. Although a steady current flows through the resistance R_T, which performs a process of energy transfer from a low-temperature body to a high-temperature body, but it is not heat in form.

In Clausius' statement the term "heat transfer" is adopted, so that "energy transportation" should not be embodied in "heat transfer."

Therefore, our result does not contradict Clausius' statement on the Second Law of Thermodynamics.

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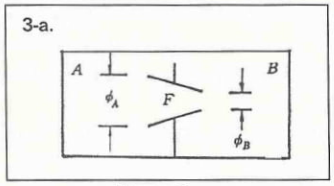

Figure 3-a.
One of the so-called second kind perpetual motion machines. F: funnel-shaped hole.

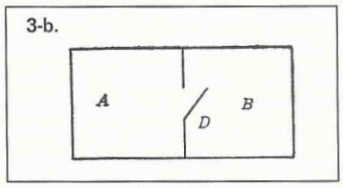

Figure 3-b.
The second kind perpetual motion machine by Maxwell. D: demon.

C) Our result does obey Kelvin's statement on the Second Law of Thermodynamics.

Kelvin's statement is that it is impossible to convert heat into work completely from a single heat reservoir without any change.

The problem of "energy circulation" is that one cannot obtain energy from one single heat reservoir in energy space, which is quite similar to Kelvin's statement. But the single heat reservoir in Kelvin's statement should be a reservoir in geometrical space, which was not well-interpreted in his statement. Therefore, to consider Kelvin's single heat reservoir as a reservoir in a generalized space (including geometrical and energy space) is allowable.

In this way no contradiction is found between Kelvin's statement and our result.

D) Our result contradicts another statement of Kelvin and Planck's statement on the Second Law of Thermodynamics.

Another statement of Kelvin on the second law is that the construction of a perpetual motion machine of the second kind is impossible.

Planck's statement is that it is impossible to make a machine operating in a circulating process, which can lift a heavy body if accompanied by cooling of a heat reservoir.

Obviously, these two statements contradict our experimental results.

3. The Significance of Energy Circulation

A) Significance to physics itself:

Energy is one of the most important ideas in physics. Through efforts for many years, men discovered the law of energy conversion and conservation. By the addition of "energy circulation," the knowledge of energy will be more complete.

B) Significance for understanding the material world:

The law of energy conservation and the law of conservation of mass reveal the fundamental properties of energy and mass.

However, mass has one more property, that is the circulation. For instance, water in the ocean converts into water vapor by sunshine radiation, the wet atmosphere is blown back to earth by wind, condensing into water drops, cloud, fog, or rain. The rain water is used by people and waste water flows into rivers and finally flows back to the ocean. In other words, mass is in a certain circulation, with a certain amount of energy consumption. We call it the law of mass circulation.

Together with the three laws introduced above, "energy circulation" must be added as the fourth nature law on energy and mass. Then we can draw a very interesting conclusion.

Since energy is conservative and circulating, energy resources will be inexhaustible. Then energy crisis will never be practical. Since matter is conservative and circulating, the energy needed for its circulation may be provided by the energy circulation. Therefore, raw material crisis will never be practical either.

C) Application of "energy circulation" to designing perpetual motion machine:

a) "Energy circulation" reveals the possibility of manufacturing a perpetual motion machine of the second kind.

b) Identification of the reality of the second kind of perpetual motion machine with the "energy circulation."

Example 1. Figure 3-a is the scheme of a so-called second kind of perpetual machine. *A* and *B* are two vacuum boxes, the free path of air molecules matches with the dimension of the boxes. A plate with a funnel-shaped hole is inserted between the two boxes. The hole diameter on the *A* side is ϕ_A, the *B* side is ϕ_B and $\phi_A > \phi_B$. The number of molecules colliding on area ϕ_A is more than that on area ϕ_B, so the pressure in *B* is higher than that in *A*. It is noted that in this design, two heat reservoirs in the energy space have not been considered. Therefore such a design is a failure because it violates the "energy circulation."

Example 2: Figure 3-b is the scheme of a second kind of perpetual machine designed by Maxwell. He assumed a demon sitting on the plate between *A* and *B*. The demon could differentiate the speed of air molecules. The gate was opened when the molecules with high speed were moving to the right or when those with lower speed were moving to the left; otherwise, the gate was closed. In this way, the temperature in box *B* would be raised spontaneously and that in box *A* would be dropped. Maxwell correctly used two heat reservoirs of the energy space in his design, but it is easy to prove that the corresponding heat engine is unsuccessful.

(D) Significance to biology:

Some bacteria can live at a temperature higher than 100°C. There are two assumptions on this existence.

First, such bacteria are constructed of quite special materials which are highly heat-resisting, and the temperature is high both inside and outside the bacteria.

Second, the bacteria is not heat-resisting in nature, but its heat-resisting membrane can shield the bacteria. If this is true, the membrane has to be able to experience a temperature gradient up to 10^6°C/cm. It is difficult to interpret this phenomenon by means of conventional ideas on heat-insulation materials. If this guess is correct, much novel knowledge concerning thermodynamics and heat-insulation materials will be available.

Reference

1. Yelin, X. 1986. "Abnormal Electric Currents in Vacuum Device," *Potential Science*, 7, 6, 43.

*At the time this book was published (1988), Yelin was employed at the Institute of Biophysics in Beijing, China.

"Energy circulation" reveals the possibility of manufacturing a perpetual motion machine of the second kind. —*Xu Yelin*

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New Energy Research Laboratory ✧✧✧ Device and Process Testing Update

Ken Rauen and Eugene Mallove

Sonofusion Calorimetry

The replication of First Gate Energies' sonofusion process has taken several turns since the update in *IE* No. 36. The excess heat reported in that issue was a last-minute inclusion before our print deadline. The experiment was not complete. After the story went to press, the experiment was taken through the final phase, that of post-calibration. The ultrasonic energy was removed from the sonofusion reactor and the reactor was allowed to re-equilibriate at a lower input power level.

Our computer data-logging and computational program recorded stabilization at +6.3 watts excess heat. What this means is that the two calorimeters in combination—the oscillator calorimeter and the reactor calorimeter (see last issue's column)—lost their calibration by drifting, and the data collected was unreliable. The post-calibration ideally should have shown 0.0 watts excess heat. The problem was traced to the air flow calorimeter for the reactor; its basic design was at fault, as heat flow pathways are not perfectly consistent under all conditions. We opted to replace that calorimeter with a Thermonetics Seebeck envelope calorimeter (see *IE* No. 29 column, and photo in this issue, p. 59), which, theoretically, integrates all heat flows. The sonofusion reactor had to be modified to fit inside this calorimeter. The sight-glass and valving superstructure was removed, and replaced by translucent teflon tubing and compression fitting disconnects. The D_2O level is observed through the tubing, and is kept above the reactor so the reactor is full at all times.

The ultrasonic transducer oscillator calorimeter was modified also. The thermal time constants of the two thermocouples used to determine differential temperature were so different that a rapid change in room temperature produced errors in the calculated heat dissipated. This was corrected by embedding the room temperature thermocouple in a 50 gram piece of steel, which was wrapped in two inches of fiberglass insulation. Now, normal room temperature fluctuations due to furnace or air conditioning cycling result in about 0.1°C fluctuations in the differential temperature.

This unusual calorimetric application for the oscillator is for the purpose of determining the amount of electrical energy that drives the ultrasonic transducers in the reactor. It is difficult to measure it directly, because of its complex waveform (although we are preparing as an electronic cross-check to do that too). In our indirect measurement, the heat dissipated by the oscillator calorimeter is subtracted from the electrical power to the ultrasonic oscillator, delivered from the wall socket and measured by a commercial power consumption meter. The result is assumed to be the ultrasonic power according to conservation of energy. This has been verified by one control test in which sonofusion was assumed to be absent. The ultrasonic power calculated by this method agreed with the reactor calorimeter when no joule heat was applied to the reactor, which kept the reactor relatively cold and probably not producing any significant fusion heat. The difference between the two methods was 0.35 watts.

Recent calibration runs of each calorimeter show errors of 0.65W maximum deviation and 0.2W typical deviation from the exponential equation relating delta-T to heat flow for the oscillator's air flow calorimeter, and 1.2% deviation from the straight line behavior of the Seebeck envelope calorimeter for the reactor, which is 0.6W of measurement error at 50W of actual heat. A minimum of five data points at varying power levels were measured for each calorimeter to

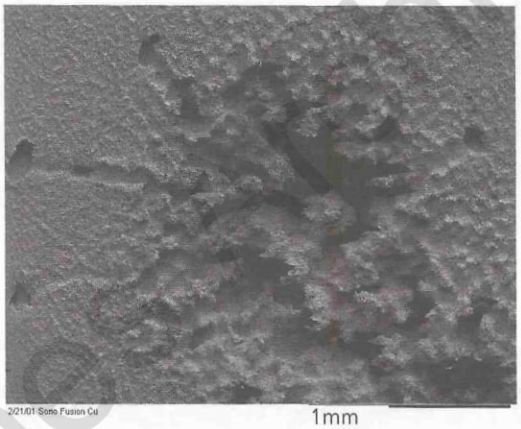

Figure 1. Copper target surface pitted by ultrasonic activation in D_2O (at 45x).

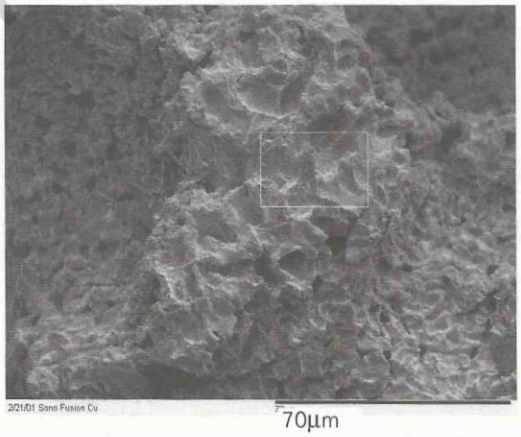

Figure 2. Magnified view (750x) of small "promontory" on copper target pitted region.

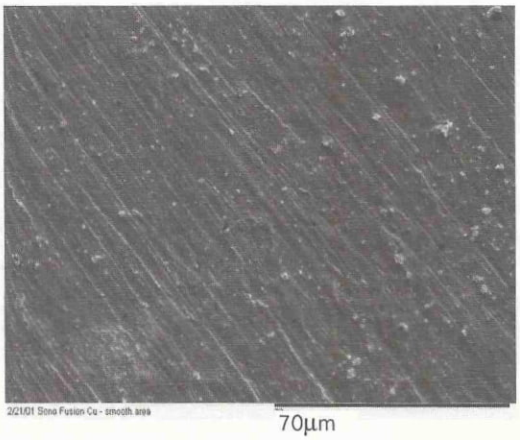

Figure 3. "Smooth," non-pitted region of copper target.

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establish the calibrations. The errors are additive, so the system detection limit is about 1.3W.

The copper target material inside the reactor has been changed to titanium. It does not deteriorate like the copper; Roger Stringham of First Gate Energies says it weathers far better than copper.

Four sonofusion runs have been completed. All four exhibited excess heat: 3, 3.5, 4, and 3 watts, in sequence, with 8 to 20 watts of ultrasonic power applied. The reactor temperatures were around 130°C and argon pressure at 25, 30, 35, and 0 psig, respectively. The first three were measured with a validating post-calibration for zero excess heat. Those zero checks showed -0.1, 0.0, and +0.1 watts, respectively, when the oscillator was turned off. The fourth run was unique. It accidentally was run at 0 psig applied argon pressure (a second argon valve to the reactor was accidentally left closed, and the reactor was operating at the vapor pressure of the water at about 130°C) and the post-calibration was done by shutting off the reactor joule heater, leaving the oscillator on. This fourth run exhibited a "zero" of +3.1 watts excess! At present, we are not sure of what to make of this result. It was followed by a joule heater recalibration of the oscillator calorimeter at the same heat dissipation of about 10W, which showed a slight deviation from the current calibration equation of only -0.4W, so this does not explain the +3.1W. It is possible that sonofusion was occurring during this intended null condition, producing excess heat that would make the two calorimeters not balance. Roger Stringham asserts that low temperature and low pressure prevents sonofusion. This one data point is of unknown value. Since it was collected under the uncontrolled condition of no applied overpressure of argon, it could be discounted because of procedural inconsistency, a bad test run. Each of these sonofusion experiments lasted 24 hours total, including the high temperature ultrasonic reaction and the post-reaction calibration, with the time for each portion split approximately in half.

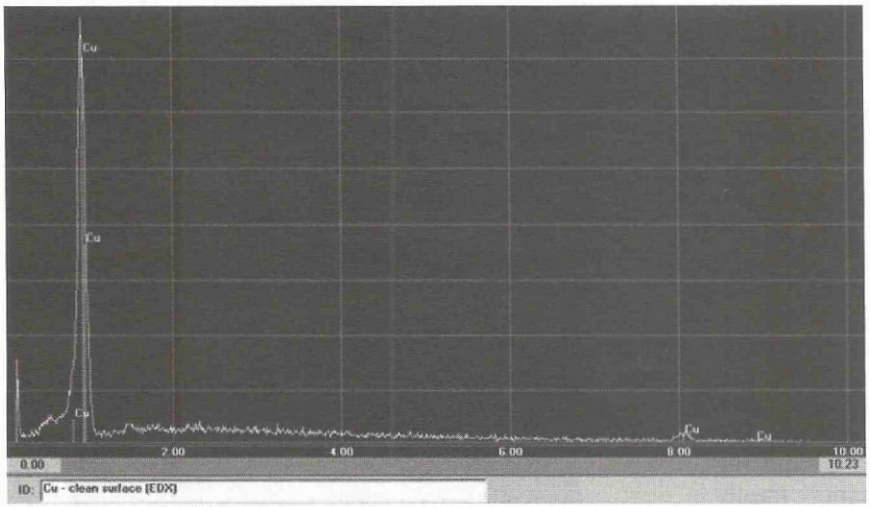

Figure 4. Auger electron (AES) analysis of "clean" copper surface ("smooth") region, showing only Cu peaks.

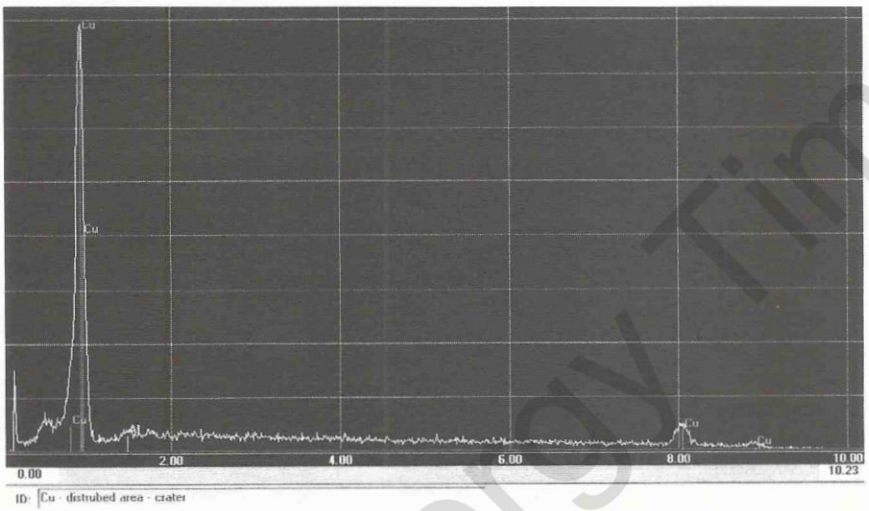

Figure 5. Auger electron (AES) analysis of pitted area of copper target. No unusual element peaks are seen.

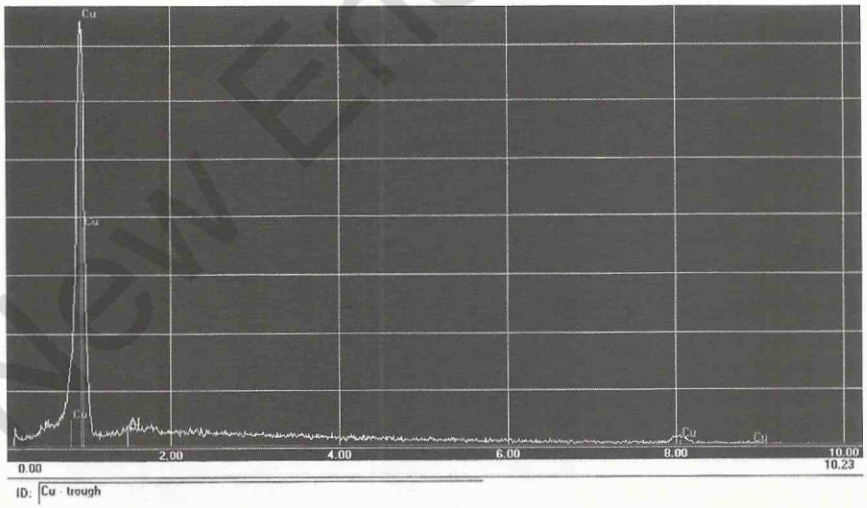

Figure 6. Auger electron (AES) analysis of pitted area of copper target, remote from central area of pitting.

Despite the one confounding data point, NERL has substantial evidence that excess heat from a cold fusion process has been documented at its facilities. However, as in any experimental work, further difficulties might be encountered that could alter this conclusion. We are planning, with the assistance of Chris Eddy of Pioneer Microsystems, Inc., to develop a direct measurement of the input electrical power. This should end any doubt about these results and we will then proceed to a system redesign on the road to making scientific laboratory demonstration kits.

Sonofusion Materials Analysis

Since heavy metal transmutation phenomena have been so widely seen in this

Device and Testing continues on page 68

New Energy Times Archive

New Energy Companies and Inventors

Status Reports on Technologies and Claims

This is a continuing series of updates on the activities and achievements of new energy companies, organizations, and inventors.

Jet Energy Technology, Inc.

Dr. Mitchell R. Swartz
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Phone: 781-237-3625
(http://world.std.com/~mica/jet.html)

Dr. Mitchell Swartz, an MIT graduate in electrical engineering (who is also an accomplished physician and radiologist) has been in cold fusion research from the beginning. He describes his company: "Energy production requires new and challenging technologies. For a number of years now, scientists and researchers in the field of loading isotopic fuels into a material have been facing a difficult struggle. The reasons why are simple. The required understanding and control of the physics, material science, and engineering are formidable. Jet Energy Technology electrodes, calorimetric equipment, and software contribute to the reliable detection of excess heat in solid state systems." The company has battled the USPTO over rejection of its cold fusion patent applications, most recently at the level of the U.S. Supreme Court (see p. 51). The company has described its research in many publications in *Fusion Technology* and in the *Journal of New Energy*. Dr. Swartz also is editor and publisher of the quarterly newsletter, Cold Fusion Times.

See *Infinite Energy* Nos. 3, 31

Energy-K Systems

Dr. Edmund K. Storms
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(http://home.netcom.com/~storms2/index.html)

Dr. Edmund Storms has been a leading researcher in the cold fusion field. Since retiring from his thirty-four year career in radiochemistry at Los Alamos National Laboratory, he has devoted most of his energies to developing high-accuracy calorimetric methods for detecting excess heat in electrolytic systems, as well as methods for characterizing electrode materials for their likelihood of being "nuclear active" in producing heat excess. Currently he is pioneering a new cathode process that appears to produce excess heat more reliably. He is working with New Energy Research Laboratory (NERL) and others to develop demonstration cells for low-energy nuclear reaction (LENR) excess heat.

See *Infinite Energy* Nos. 4, 5/6, 8, 24, 27, 29, 31, 32, 34

The Cincinnati Group

Don Holloman
9772 Princeton-Glendale Road, Cincinnati, Ohio 45246
Phone: 513-874-4943 • Fax: 513-874-6982
(http://web.gcis.net/cincygrp/aboutthe.htm)

A religiously-inspired group of researchers who have investigated low-energy transmutation phenomena. To their credit, they offer for sale an electrolytic transmutation kit, which appears to demonstrate the transmutation of thorium and uranium to non-radioactive elements of lower atomic weight. Testing by scientists outside the company has validated the technology. The company has seemed less active in the field since the untimely death of its lead researcher Stan Gleeson in 2000.

See *Infinite Energy* Nos. 13/14, 15/16, 17

EEMF (Emerging Energy Marketing Firm, Inc.)

Dr. Hal Fox, Director of the Institute for New Energy
3084 East 3300 South, Salt Lake City, Utah 84109
Phone: 801-466-8680 • Fax: 801-466-8668
(http://www.padrak.com/ine/)

Hal Fox, an engineer with broad experience in many fields, has since 1989 edited and published a variety of pioneering publications in the new energy area, including *Fusion Facts, New Energy News (NEN)*, and the *Journal of New Energy*. He has also participated in the difficult struggle to obtain funding for the field. In the March 2001 *NEN* he offered this view: "In my judgment there is no reason to encourage people to invest in expensive short-term solutions when, with less capital, one or more of the new-energy systems could be put into production. There are four such technologies that can be placed into production during 2001-2002 with relatively modest capital investment. Our company (EEMF) is working on two of the four. We have been promised the funding required. Here is my oft-cited list (and we receive contacts periodically from other new-energy developers with additional devices to be considered): 1. Randell Mills thermal-producing device which is characterized as collapsing the hydrogen atom below its ground state; 2. The independent discovery by Kenneth Shoulders, Hal Puthoff, the late Stan Gleeson, Alexander Ilyanock (Belarus), and Mesyats (Russia) of high density charge clusters. See U.S. Patent 5,018,180, the first patent to claim tapping zero point energy; 3. The Koldamasov device which reportedly produces 20 times as much thermal energy as input electrical energy; 4. Tom Bearden, *et al.*, Stationary Electromagnetic Generator. All are patented or have patents pending. For less than $10 million any one of these technologies can be put into commercial production within two years."

See *Infinite Energy* Nos. 12, 15/16, 20

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COLD FUSION TIMES

The Journal of the Scientific Aspects of Loading Isotopic Fuels Into Materials

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Upcoming Events

EnV 2001
Global Solutions for Sustainable Mobility
June 10-13, 2001
Lawrence Technological University
Southfield, Michigan
Focuses on the technology and global standardization of environmental vehicles and alternative fuels.
ESD: The Engineering Soc.
26100 American Drive
Suite 500
Southfield, MI 48034
www.esd.org

Midwest Renewable Energy Fair
June 22-24, 2001
Portage County Fairgrounds
Amherst, Wisconsin
www.the-mrea.org

Windpower 2001
June 3-7, 2001
Grand Hyatt Hotel
Washington, DC
http://www.awea.org
Laura Keelan at AWEA,
202-383-2500 or
Laura_Keelan@awea.org

KeelyNet Convergence 2001
June 16 & 17
alternative science hardware conference
http://www.keelynet.com
KeelyNet
P.O. Box 570309
Dallas, TX 75357-0309
(see ad on page 1)

Intersect 2001
Electricity, Cosmology, and Human History
July 6-9, 2001
The Flamingo Hilton
Laughlin, Nevada
Two key speakers of interest:
Halton Arp
John O'M. Bockris
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New Hydrogen Technologies and Space Drives
June 23 - 24, 2001
Congress Center
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Weinfelden, Switzerland
Organizers:
Institute for New Energy Technologies (INET),
Jupiter-Publishers and
German Association for Space Energy (GASE)
P.O. Box CH 4622
Egerkingen, Switzerland
Phone/Fax: 062 38898 50/1
E-mail:
adolf.schneider@datacomm.ch

Conference on Thai Power
July 19-20, 2001
Hotel Plaza Athenee
Bangkok
Organized by
Asia Business Forum
Contact:
Nuchada Paradeevisut
nuchada@abf-asia.com

Conference on Space Physics
November 9-11, 2001
Karwar, Karnataka India
Now accepting papers.
www.tewari.org
SPG Conference 2001
Scientific & Spiritual Research Council
Conference Organizing Committee, P.O. Gotegali
Karwar, Karnataka
581 317 India

The Ninth International Conference on Cold Fusion (ICCF9)
Tentatively scheduled for May 2002 in Beijing, China. Watch for further details as they become available.

Russian Cold Fusion Conference (RCCNT-8)

Summary of report submitted by Yuri Bazhutov, Organizing Committee

The Eighth Russian Conference on Cold Nuclear Transmutation of Chemical Elements (RCCNT-8) took place in Dagomys from October 4 to 11, 2000. The meeting was sponsored by the Russian Academy of Science, Nuclear Society of Russia, Russian Physical Society, D.I. Mendeleev Russian Chemical Society, Moscow State University, Russian Peoples' Friendship University, and the State Technical University (MADI).

The following thirty-three participants were in attendance, representing five countries: Grigori Azbarov, Dunkan Company (Russia); Dmitri Baranov, Research Institute of High Temperatures, Russian Academy of Sciences (Russia); Yuri Bazhutov, Research Center of Physical and Technical Problems, "Erzion" (Russia); Nikolai Volkov, Moscow Physical Engineering Institute (Russia); Igor Goryachev, Kurchatov Institute, Research Institute of High Technologies (Russia); Irina Goryacheva, Kurchatov Institute, Research Institute of High Technologies (Russia); Vladimir Gryshin, Moscow Physical Engineering Institute (Russia); Victor Zelenski, Kharkov Physical and Technical Institute (Ukraine); Alexander Karabut, Lutch Scientific and Industrial Association (Russia); Vladimir Nosov, Moscow State University, Department of Robotic Engineering (Russia); Victor Sharkov, Triniti Scientific Center and Duncan Company (Russia); Boris Tichonov, Triniti Scientific Center (Russia); John Dash, Portland State University, Department of Physics (U.S.); Anatoli Pokrovski, Tenex Scientific Research Center (Russia); Boris Rodionov, Moscow Physical Engineering Institute (Russia); Vitali Romodanov, Tenex Scientific Research Center (Russia); Valeri Sarkisov, Switex Company (Russia); Yuri Savin, Russian Physical Nuclear Center, National Research Institute of Experimental Physics (Russia); Irina Savvatimova, Lutch Scientific and Industrial Association (Russia); Victor Serov, Russian Physical Nuclear Center, National Research Institute of Experimental Physics (Russia); Yakov Skuratnik, Tenex Scientific Research Center (Russia); Pavel Sadilov, Sochi State University (Russia); Ai-Yong Song, Creative Energy Technology Co. (Korea); Nikolai Koroviakov, Institute of Structural Analysis of Physics (Russia); Alexander Trunev, Sochi Research Center of the Russian Academy of Sciences (Russia); Leonid Fominski, Usmar Company (Russia); Frisone Fulvio, University of Catania, Department of Physics (Italy); Coletta Lucia, University of Catania, Department of Physics (Italy); Frisone Carmello, University of Catania, Department of Physics (Italy); Leonid Kholodov, V.P. Barmin General Machin Building Design Bureau (Russia); Ivan Chernov, Tomsk Polytechnical University (Russia); Andrei Churkin, Moscow State University, Department of Solid State (Russia); Vladimir Shadrin, Siberian Chemical Plant (Siberia).

Twenty-four reports were delivered at the conference (five theoretical papers, fifteen reports on experimental work, two reviews, and two short, informative presentations).

The experimental reports delivered at the conference confirm the primary characteristics of the physical phenomena under consideration. These manifest themselves under highly specific conditions in the various methods of stimulating samples by loading them with hydrogen or deuterium. Researchers have observed both the appearance of excess heat (Chernov, Miles, Baranov,

Russian conference continues on page 68

New Energy Times Archive

Tomorrow's Batteries: Good Things in Smaller, Lighter Packages

Bennett Daviss

These days, the research spotlight shines brightest on fuel cells, water chemistry (as fuel additives), and other recent entrants to the energy arena. However, with less glamor but just as much creativity, researchers are engineering innovations into one of the oldest power storage technologies—batteries.

More than one group of scientists is working to make the conventional heavy, box-shaped vehicle battery a museum object. Two new technologies are reconfiguring it, both aiming to overcome the built-in inefficiencies of the lead-acid battery's traditional design.

The battery under your car's hood is a series of cells. Each cell holds two plates. One is lead, the other lead oxide. The plates are bathed in sulfuric acid, which peels ions off the lead plate and passes them on to the lead oxide plate. The negative ions generated in each cell are collected and sent to the battery's positive terminal, creating a current.

The plates are made of lead—nearly the densest naturally occurring metal—for two reasons. First, a vehicle bounces and vibrates as it moves. The battery has to stand up under those conditions for years, and density means durability. Second, the plates are drilled full of holes to expose as much lead as possible to the electrolyte, boosting the battery's efficiency and life. The denser the metal, the more holes you can drill without the plate falling apart.

The object is to balance the amount of open space in the plates with the practical demands for stability and rigidity—and, in that contest, efficiency is the loser. Traditional lead-acid batteries usually manage only 10 to 15% percent efficiency, not to mention also being unwieldy and, too often, corrosive to anything they touch.

The first innovation on the horizon will shrink the traditional unwieldy box to the size of six size flashlight batteries while retaining all the power needed to start a car or small truck.

The only active portion of a battery's electrolyte is the portion nearest the surfaces of the metal plates. The rest is not only inactive, but isn't a particularly efficient electrical conductor. In fact, it can set up considerable electrical resistance.

The new design uses thin foils in place of heavy plates. "That means that the distance from any point in the electrolyte to the surface of the current collector, which is the foil, is very small," explains Vish Viswanathan, a senior research engineer specializing in batteries and fuel cells at the Pacific Northwest National Laboratory (PNL), managed by the Battelle Memorial Institute for the U.S. Department of Energy. "If you shorten the distance, you cut the resistance." As a result, the smaller battery design delivers the same amount of usable power as its hulking ancestor; the new architecture simply slashes resistance and, therefore, the amount of extra lead, space, and electrolyte needed to overcome it.

Bolder Technologies Corp. in Golden, Colorado, has been the first firm to bring the technology to market and has licensed its battery architecture to Johnson Controls. Optima Batteries, in Aurora, Colorado, also has developed a version of thin-foil batteries.

They'll have another kind of novel company when Alvin Snaper's new battery appears. This second new technology cuts the conventional lead-acid battery's weight by up to half while boosting its efficiency by almost three times to as much as 40%.

Snaper (pronounced "snapper") is no stranger to innovation. He's credited with inventing the type ball for IBM's Selectric typewriter and concocting Tang, the astronaut's orange drink. This time, he's figured out a way to fashion the lead in batteries not as plates but as foam.

"The advantage is that a porous foam exposes several hundred times more of the lead's surface area to the electrolyte," he says. "No part of the electrolyte is much farther from the lead than any other part." Snaper likens the three-dimensional foam to a geodesic dome, a structure that's mostly open space but that retains tremendous resilience and strength. "We retain the strength and durability of lead but need far less of it."

"Conventional lead-acid cells have to be charged slowly because they build up a lot of heat" due to internal resistance, Snaper explains. If current is crammed into the battery too fast, the cells generate so much heat that the battery could be damaged or even explode. "Our foam is porous enough to dissipate heat quickly," Snaper explains. "It also keeps much more of the electrolyte in contact with the lead, which minimizes internal resistance. So our battery can be charged both faster and at a lower voltage."

Snaper is co-founder and vice-president for technology of Power Technology, Inc., a Las Vegas firm now "in active discussions" with conventional battery manufacturers to commercialize the foam cells.

"Our technology wouldn't require any change in the manufacturing process other than substituting foam plates for metal plates," he notes. "Our whole idea was to design a plate that would be compatible with existing production technology."

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But don't expect to see Snaper's batteries any time soon in your neighborhood auto parts store. His target market is not conventional cars and trucks, but electric vehicles.

Snaper will be facing some new competition. Researchers are looking beyond the state-of-the-art metal nickel hydride batteries for electric vehicles to new kinds of lithium chemistry to cut weight and add travel time.

Lithium, the world's lightest metal, is not only abundant in nature but also has the greatest electrochemical potential of any metal—the ideal material for a battery. But the lithium ion battery, now standard issue in notebook computers, cell phones, and other portable electronic gear, fares less well on a large scale. "Even the small cells need a lot of control when charging," PNL's Viswanathan explains. "When you step up that consideration to several cells in series or parallel, it raises issues for systems engineering" that are proving difficult to solve.

Instead, engineers are turning to lithium polymer batteries as more promising.

Lithium polymer chemistry, with its solid plastic electrolyte instead of the liquid organic version that lithium ion cells use, retains the light weight of lithium ion cells while eliminating many of their drawbacks.

In a lithium ion cell, a cathode of lithium metallic oxide opposes an anode made of graphite. The electrolyte ferrying lithium ions between the two is an organic liquid. In a lithium polymer cell, the electrolyte is a solid plastic and the graphite is eliminated altogether. The polymer cells can be made much lighter and smaller, and the easygoing solid electrolyte does away with most of the complexities involved in charging large lithium-ion cells.

Consequently, engineers forecast that lithium polymer batteries could be made with an energy density of up to 200 watt-hours per kilogram of weight, compared to a lead-acid battery's 35. While lead-acid batteries could power an electric vehicle for perhaps 100 miles on a charge, lithium polymer cells could keep the vehicle going for more than twice that distance.

Those advantages make it worth the trouble required to find ways to boost the lithium polymer battery's notoriously low conductivity. By keeping the alternating layers of lithium and electrolyte thin, designers are hoping to overcome the system's stubborn electrical resistance. "If they can bring the conductivity to a reasonable level," Viswanathan says, "it will be a good candidate for an electric vehicle battery." The U.S. Advanced Battery Consortium, a coalition of vehicle and battery makers, is betting on it: the group has awarded more than $60 million to a team of researchers led by 3M to bring the lithium polymer battery to commercial reality.

But that won't be the battery's only use. A research team at Tennessee's Oak Ridge National Laboratory (ORNL) has created a lithium polymer battery out of thin films of amorphous materials. The result is a cell thinner than the plastic wrap in your kitchen cupboard.

The group set out to engineer a better back-up battery for digital devices. Currently, internal batteries in computers support data stored in chips if external power is cut off. But those batteries are much bigger than the chips themselves and can't be recharged.

ORNL's cell solves both problems as well as others. The layers making up the solid, pliable battery can be deposited directly onto a chip or its protective ceramic coat. Also, the battery can be recharged, operates over a temperature range of -15°C to 150°C, and has been found in tests to deliver 3.8 volts of potential—more than any other thin-film batteries so far. Just as neat, there's little engineering involved. The group only had to borrow the deposition techniques used routinely by chip makers.

The team's biggest challenge has been to find the right chemistry. Lithium was an obvious choice for the anode. For the cathode, the team eventually settled on noncrystalline vanadium oxide, which lets lithium ions pass in and out with minimal deformation of the structure. Also, the amorphous version of the material can hold three times as many lithium ions as the crystalline structure, yielding a higher-capacity cell.

Partnering with battery maker Eveready, the group began experimenting with different electrodes. Eveready scientists came up with a high-density, long-lived cell that used an oxysulfide electrolyte. However, the cells needed an extra layer of lithium iodide to shield the electrolyte from corrosive attacks by the lithium layers.

John Bates, the ORNL team leader, combed the literature for clues and found that nitrogen added to certain kinds of glass improved their durability in contact with air and water vapor. Adapting the tactic, the group sputtered lithium onto the thin-film cells using nitrogen instead of the usual mix of argon and oxygen. It worked. The final compound for the thin-film batteries was now in place: an electrolyte of lithium phosphorus oxynitride.

"Nature much prefers oxygen to nitrogen in compounds such as these," Bates notes, "but this small amount of nitrogen greatly improves the performance of the electrolyte. Tests show that [our] nitrogen-containing electrolyte has 30 times the lithium ion conductivity of a film of pure amorphous lithium ortho-phosphate."

Now the group has yet another problem to solve: the thin-film cells corrode in air and currently must be enveloped in argon. The ORNL and Eveready teams are testing materials that can be layered over the cells

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to seal them without diminishing the cells' capacities.

Bates also has a bigger goal in mind. "If such a battery could be scaled up to propel electric vehicles, it would surpass lead-acid batteries' energy density by a factor of eight" and boost that of lithium-iron sulfide batteries fivefold, he says.

There's one more advantage to thin-film batteries: they can be formed into virtually any shape and fit into almost any space. For example, some engineers envision building batteries to fit into the frames of electric vehicles.

The U.S. Army already is testing the malleable batteries in a different context. It's "Land Warrior" project is planning to outfit some of tomorrow's infantry troopers with a "Soldier Integrated Protective Ensemble." The gear includes a heat-sensing weapon sight, laser rangefinder and digital compass, infrared aiming light on the rifle, a video camera, a wearable computer with a drop-down eyescreen, and a laser detector to tell the soldier if he's in an enemy's infrared crosshairs. How to power all that equipment? The Army is experimenting with thin-film batteries that also can serve as the frame for the soldier's backpack.

But there's an even more distant horizon in battery science, one being scouted by BlackLight Power. The New Jersey firm claims a proprietary process by which a vaporized catalyst induces a hydrogen atom's electron to drop to a lower energy level, or orbit, around the atom's nucleus (*Infinite Energy* No. 17). This "catalytic hydrogen collapse" frees energy in the form of ultraviolet radiation that makes heat. The altered hydrogen atom reacts with an electron to form a hydride ion, which in turn reacts with other substances (also proprietary) to form something the company has dubbed a "hydrino hydride."

BlackLight Power's hydrino-hydride battery, still on the engineer's bench, uses hydrogen or a hydrogen-lithium combination as featherweight electrodes to manage the vast harvest of energy loosed by hydrino hydrides.

The company forecasts that the design will boast as much as 180 watt-hours per cubic centimeter, compared to as little as 0.3 in today's lithium-ion cells, and almost 200 times the power density. But that's only the beginning.

Ultimately, "the energy density projection for BlackLight Power's battery is as high as 10,000-plus watt-hours per kilogram," the company reports. "The voltage may be 70 volts compared to the average voltage for a lithium-ion battery of 3.6. [Our] battery compound may release about 100 times the energy and 1,000-plus times the power of any other conventional chemical used in batteries. This, in turn, means that proportionally less [material] will be required to manufacture [our] battery. The overall weight should not exceed one-tenth that of a conventional electric vehicle battery. This implies that the cost of manufacturing [our] battery will be correspondingly low."

Those rosy figures lead the company to see an equally rosy future for its hydrino-hydride cells as power sources for everything from cell phones and notebook computers to electric cars. However, BlackLight Power remains mum about the date by which its cells might be ready to prove themselves in the marketplace.

When (or if) the futuristic power cell emerges from BlackLight Power's lab, it'll face a varied group of competitors and constantly evolving technologies. One thing that battery engineers never run short of is energy.

Bennett Daviss covers energy, science, and technology for several national publications.

Cancer Fear Following the Chernobyl Accident

Eleni Petridou*

Abstract from the American Chemical Society Division of Nuclear Chemistry and Technology National Meeting, held April 2001 in San Diego, California:

It all started with an initial explosion and fire at Reactor No. 4 at the Chernobyl Nuclear Power Plant and a ten-day long release of gases and aerosols containing radioactive materials that were widely dispersed across the former USSR and the European region. The level of radiation to which the general public, as contrasted to the accident control workers (liquidators), was exposed was overall low. Even for the closest city (Pripyat), the average whole body exposure was estimated to be at most 10 rads per person, whereas for the people living further away, the whole body collective dose was estimated at only 100 to 500 mrem per person. It has been calculated that the excess (life-long) cancer mortality was at most thirty deaths per 10,000 individuals exposed, each one to 10 rads. If the background cumulative (life-long) mortality from cancer is 1,500 per 10,000 individuals then the relative mortality would be 1.02 (1,530/1,500), which is almost undetectable. In retrospect, no excess mortality from cancer of any type has been documented nor has there been any evidence of increased prevalence at birth of congenital malformations. There have been reports of increased incidence of thyroid cancer in proximate areas, but crucial methodological issues have not been clarified. Perhaps the only credible publications are those in *Nature,* indicating that children in Greece and Germany exposed *in utero* may have been at higher risk for the extremely rare form of leukemia, that of infant leukemia. In contrast, we found that in Greece, that about 2,500—otherwise wanted—pregnancies (2.5% of the total for 1986) were artificially terminated because of uncertainty, anxiety, and perceived radiation risk on the unborn child on the part of both parts, their parents and the attending obstetrician. In conclusion, panic generated far more loss of life than the physical phenomenon people have been scared of. To paraphrase a distinguished orator, fear itself is more fearsome than most events.

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New Energy Times Archive

New Urban Myth About Energy Pervades Highest Levels of Government

Jed Rothwell

For the past year and a half, a weird urban myth has infected policy debates about energy in the U.S. According to this myth, the Internet consumes 8% of U.S. electricity, and the Internet plus computers in general consume 13%. In another decade they will take up about half of all electricity, creating a tremendous boom in the demand for electric power. The myth was cooked up by Mark Mills, a coal mining industry lobbyist from the improbably named Greening Earth Society.[1] In fact, experts at the Department of Energy (DOE), the Edison Electric Institute, EPRI, and elsewhere agree that computers and telecommunications (voice and Internet) consume roughly 3% of U.S. electricity, and the use of computers and the Internet has reduced energy use overall, by improving efficiency and offsetting energy-intense communication such as mail and travel.

This dispute would not matter, except that the confusion has spread to the highest levels of government. President Bush quoted the 13% figure during his campaign. The Energy Secretary recently quoted it,[2] and Congress has invited Mills to testify.[3] The story has been published in *Forbes* and the *Wall Street Journal*. I do not wish to politicize the pages of this magazine or unfairly attack either party. The previous administration did little to conserve energy. But this kind of misinformation at the highest levels of government may lead to bad policy. It is disconcerting that an administration top-heavy with people from the oil industry appears to know little about electricity, fuel, and energy.

It is disconcerting that an administration top-heavy with people from the oil industry appears to know little about electricity, fuel, and energy.

Like most urban myths, this one is packaged with authoritative sounding, all-too-exact percentages and statements that anyone can disprove with a little common sense. For example, Mills claimed that the average desktop computer consumes 1,000 watts of electricity. He has been challenged about this repeatedly, even during Congressional testimony, but he blithely repeats himself. Let us examine these 1,000 watts in excruciating detail, before stepping back to look at the big picture.

A plate on the back of a computer, video screen, or any other electric appliance shows the maximum rated power consumption. For a computer, including the video screen and other peripherals, the combined maximum rating is far less than 1,000 watts. Actual measured power consumption is usually about half the maximum. Late model desktop computers consume 100 to 250 watts, and laptop computers consume 35 watts. Power decreases with each new generation of computers, screens, and printers for two reasons: 1) The voluntary Energy Star program appeals to the public; 2) New generations of computer chips must be more energy efficient because the circuitry must be packed more tightly, to improve performance. An inefficient chip would be destroyed by waste heat. Cooling a CPU chip is a major engineering headache.

Most of the energy consumed by a computer system goes to the screen (CRT), which produces light, offsetting the need for overhead lighting. As a source of light, a computer CRT is less efficient than an incandescent bulb, but CRTs will soon be replaced by LCD screens which use much less energy, in addition to being smaller, lighter, longer lasting, and easier on the eyes. They are more efficient than fluorescent lights. LCD screens will eventually replace television tubes as well. The DOE estimates that Americans consume more power watching television at home than using computers.

When told that computers use only a few hundred watts, Mills countered that the real energy cost is not in the computer itself but in the equipment "behind the wall": the servers that tie computers together, and the telephone network that constitutes the Internet. He claims this equipment consumes roughly 750 watts. This is incorrect. A single low-powered server connects dozens of computers together, at an average of a few watts per machine. In a corporation many computers share a single high-speed data line to the telephone central office. At the central office, tens of thousand of telephone lines terminate in a crowded bank of equipment cabinets. If each line generated 750 watts, the building would go up in flames. Mills countered this argument by saying that each Internet server computer at the other end also consumes hundreds of watts. Indeed, in California "server farm" data installations are some of the most serious energy drains, although next generation processors are expected to reduce consumption by one or two orders of magnitude.[4]

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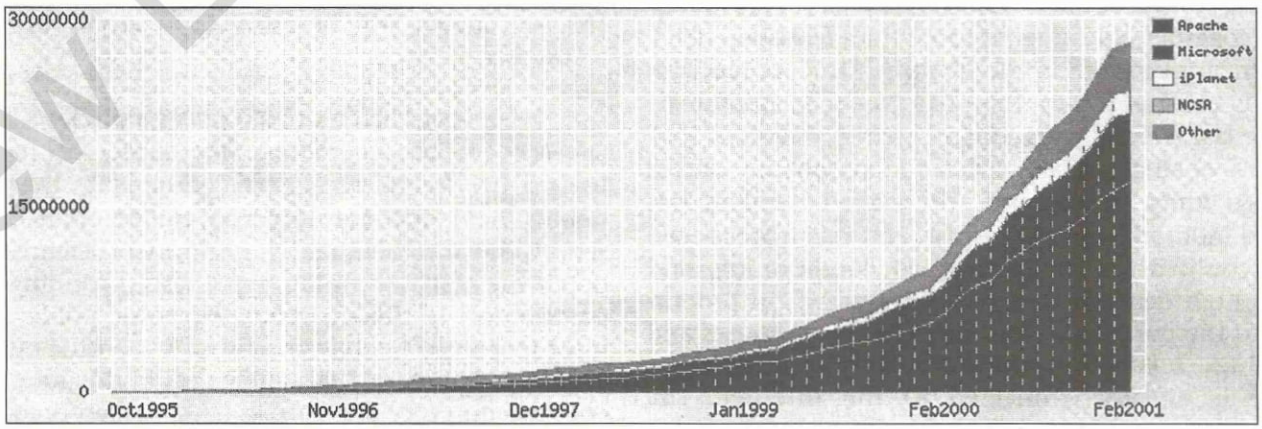
Mills overestimated the number of server computers in use, because he misunderstood a study he cites.[5] He confused the number of domain names (such as "infinite-energy.com") with the number of servers. As the study explained, one server may host hundreds of domain names. (Conversely, a few popular domains may require many servers.) Some of Mills' estimates seem to be predicted on another mistaken notion about the Internet. His figures would only add up if you were continuously connected with a remote server every minute you are on the Internet, and you were given exclusive use of the server. This arrangement would make Internet commerce prohibitively expensive. Nearly all of the time you spend on the Internet you are not actually "connected" anywhere, and you use no resources. Suppose you spend ten minutes paging through the Amazon.com on-line catalog to order a book. You do not "tie up" the server and the Internet connection the whole ten minutes, the way you would if you were talking to a human sales clerk on a long-distance line. The Amazon server ignores you until you request another book title or finish filling in your credit card number. During the ten-minute session, the Amazon server and Internet routing computers devote only a fraction of a second to your needs. The information may take several seconds to appear on your screen, but that is because other people are using the Internet, or because you have a slow modem.

It is often said that telecommuting will save energy, but the extent of the savings are not widely appreciated. Telecommunications have always consumed orders of magnitude less energy than mail or other physical communication. In 1866, after the second transatlantic submarine cable was complete, Latimer Clark conducted a famous experiment. The two cables were temporarily connected at the Newfoundland end, forming a single submarine circuit more than 4,000 miles long. Clark sent a clear signal through this cable using, as a source of power, "a battery made out of a lady's silver thimble containing a few drops of acid."[6] A conservative rule of thumb used by telephone company engineers is that a central office consumes 3.3 kWh per 1,000 minutes of voice connect time.[7] This works out to be roughly 200 watts per connection. It probably includes everything in the building from overhead lights to elevators. Very little electricity is used directly in communication, and newer, faster equipment may require less power, rather than more. A late-model central office connection card uses 37 mW per subscriber when the line is active, and 1 mW in stand-by mode.[8] High-speed ADSL connectors consume 150 to 200 mW per subscriber line. As noted above, in a corporation a single high-speed connection is shared by many users. An individual fiber transmits hundreds of megabytes per second, over hundreds of kilometers, consuming 1 to 10 mW when driven by lasers, or 0.1 mW driven by LEDs.[9]

Data communication is much more economical than voice. You can communicate in writing over the Internet with anyone on earth for 300 hours per month at a fixed fee of only $20. If Internet energy costs were as high as Mills claims, every Internet service provider (ISP) would go bankrupt.

Mills has repeatedly claimed that it takes one pound of coal (450 grams) to transmit 2 megabytes of data, which is even more outlandish than his other estimate.[10] This much coal produces ~11 MJ of raw heat. An old, inefficient power plant converts this heat to ~3.6 MJ of electricity, or ~0.5 kWh per megabyte of data. This much electricity costs 3 cents in most of the U.S., whereas telecommunications industry publications estimate the cost of data transmission at 0.11 cents per megabyte. Energy is only a tiny fraction of this cost; most of the money goes to salaries, fiber optic cable, and equipment that becomes obsolete rapidly. In short, Mills' estimate is off by a factor of at least 300, and probably 1,000 or more. Mills is a spokesman for the coal industry, yet he claims that coal is thousands of times less efficient than it really is. The TAT-14 undersea cable from North America to England uses roughly 10 kW, or 100 watts per repeater, including power cable resistance. It transmits at 80,000 MB per second. This comes to 0.13 joules per MB, compared to



Source: www.netcraft.com/Survey/Reports

Growth in the number of domains from 1995 to 2001. Internet growth has leveled off in the past year.

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Mills' estimate of 900,000 joules per MB.[11]

Mills has been promoted by George Gilder, who is supposedly a technology guru. He and other major decision makers sometimes appear to be innumerate, with little knowledge of basic technology or simple dollars and cents cost accounting.

Mills has sometimes backed off from his claims. He said he "no longer cares" what percent of electricity the Internet consumes. "I have chosen not to engage in the question of whether it's 5% or 6% or 8% percent." Mills has been cited as an expert in energy by the administration, Congress, and the *Wall Street Journal*. An expert would not casually dismiss his own earlier claims in this fashion, or say he does "not care" about an incorrect market projection. A mistake on this scale—the difference between 5 and 8% of total national demand—would bankrupt electric power companies nationwide, especially when the actual figure is less than 3%. Mills dismisses the problems of global warming and pollution with cavalier cynicism, which will not endear him to the public. He says that environmental activists like Lovins can "discuss global warming all they want." They want to "save the planet. I'm not interested in saving the planet . . . My objective is to keep silicon lit. And there's going to be a huge market for people who want to keep silicon lit."[12] If the coal producers, power companies, and Secretary of the Department of Energy are seriously planning for, or depending upon, the emergence of this "huge" phantom market for "Internet electricity," they will overbuild and find themselves with excess facilities. Much smaller errors overestimating the market have left the Japanese electric power companies in serious trouble.

The Big Picture

Jonathan G. Koomey *et al.*, at Lawrence Berkeley, specialize in measuring electric power consumption.[13] They took Mills to task. They measured actual computer power consumption, they visited telephone central offices, and they carefully paired each of Mills' claims to the data in peer-reviewed industry studies. They showed that his estimates are incorrect by factors ranging from 2 to 25. Computers and telecommunications together consume no more than 3% of electricity, and this demand is not growing. They started with the big picture. Internet use has grown tremendously in the last twenty years. If the Internet will soon soak up 50% of all electricity, it should have already caused a huge jump in demand. Yet overall demand has grown modestly, at 2% per year, and this increase can be accounted for by lighting, air conditioning, and other high demand uses that have grown in proportion to the population and the number of houses and buildings. A large fraction of houses and nearly every office is already connected to the Internet. The Internet already consumes nearly all of the power it will ever need. In the future, faster computers and fiber optic connections will consume less power, not more. As noted above, it is physically impossible to make them consume more; they would overheat. The newer data routers transmit data hundreds or thousands of times faster than previous models, yet they require less power.

More to the point, computers and the Internet save energy in countless ways. An e-mail message is cheaper than a letter or a telephone call because it uses less energy, paper, and other resources. Computerized grocery inventory systems reduce overstocking, which cuts back waste from spoiled vegetables and fruit, saving millions of pounds of food, and the fuel it takes to grow, process, and ship that food. The computerized warehouse at Amazon.com consumes roughly 16 times less energy and less space than a retail bookstore. Computerized industrial production and remote monitoring systems have greatly reduced energy consumption.[14]

Mills dismissed Koomey's objections during his testimony. He said Koomey "exhibited alarm at the proposition that the Internet uses large and rising amounts of electricity," as if a scientist would be afraid of data itself, and would deny an obvious trend in his own field of expertise. Koomey responded, "The alarm my colleagues and I raised is at the incorrect data and flawed assumptions used in Mills' analysis, not at whether 'the Internet uses large and rising amounts of electricity.' I am concerned that many people and institutions are treating his analysis as technically credible when it so blatantly conflicts with measured data." After several tit for tat exchanges, Koomey expressed his frustration:

> In the past year and a half, I have been witness to an extraordinary event: an analysis based on demonstrably incorrect data and flawed logic has achieved the status of conventional wisdom, in spite of my and my colleagues' best efforts to refute its assertions. The results continue to be cited by an unsuspecting press, and even by people who ought to know better.[15]

His sentiments will be familiar to any cold fusion researcher.

Other Unscientific Energy Policies

The new administration has expressed hostility toward the Kyoto agreement, presumably because it doubts that global warming from carbon emissions is a serious threat to mankind. A minority of scientists also doubt the global warming hypothesis, including some contributors to this magazine. However, public policy must be guided by the consensus of scientific opinion. This does not mean that policy should ride roughshod over the minority opinion, as it very often does, especially not at the research funding level. Legitimate

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researchers who believe that carbon dioxide does not cause global warming should be funded, and their views considered carefully. But in the end, when the majority of scientists agree that global warming is real, or that AIDS is caused by a virus, or that some form of hot fusion may be the most promising method of generating fusion energy, more research money should be devoted to these conventional approaches, and public policy should be based upon them. A small fraction of research funding should be reserved for the small fraction of scientists who disagree with the majority views.

The *New York Times* reports that the administration is rescinding several rules passed by the Clinton administration to enforce conservation.[16] This seems ill-advised in the face of looming electricity shortages in California, New York, and elsewhere. Some of these rules were worked out in cooperation with industry experts over several years, and industry spokesmen say they favor the new rules. The *Times* reports that under the new regulations, "water heaters will need more insulation and may require a U-shaped trap to stop hot water from rising up the pipe when no faucet is turned on, keeping the water in the heater until it is needed. Efficiency improvement is put at 5 to 9%." Commonsense innovations such as a U-shaped trap cost virtually nothing, and should have been made universal in building codes years ago. A water heater industry spokesman said that manufacturers want "a standard which they could plan towards. Certainty is always better than uncertainty."

Another new rule dictates that beginning in 2006, new central air conditioners will require 30% less electricity than today's models. Manufacturers pressed for a 20% reduction during negotiations. The administration seems poised to eliminate any reduction, even though air conditioners are a major source of energy consumption, and improving them would be cheaper than building new power plants. The *Times* quoted Dan W. Reicher, assistant secretary for energy efficiency and renewable energy in the Clinton administration: "It's stunning that at the very moment the new administration is telling us there's an energy crisis, they would be looking at rolling back standards that will save us more energy than virtually anything else we've done in twenty years." Efficiency experts say that in California air conditioning consumes 28% peak-hour electricity in the summer. On April 13, 2001, the administration announced that it would implement the new standards for washing machines and water heaters. The proposed standards for air conditioners are still on hold.

In February the *Yomiuri* reported that in Japan the peak demand for electricity crested in the summer of 1996 and has been falling steadily ever since. Power company capital investment has fallen to the level last seen in 1979. Experts ascribe decreased demand mainly to improved air conditioners, natural gas powered air conditioning, and privately owned large-scale generators and co-generators. The increase in natural gas cooling and private generators over the last four years equals about as much energy as a 200 MW large central power plant would supply.[17]

Footnotes

1. Mills, M.P. 1999. "The Internet Begins with Coal: A Preliminary Exploration of the Impact of the Internet on Electricity Consumption," Arlington, VA: The Greening Earth Society, 1999. The name of this organization is based on the notion that additional carbon dioxide will encourage plant growth. This may or may not be true [*Editor's Note:* See also Idso, S.B. 1995. *CO_2 and the Biosphere: The Incredible Legacy of the Industrial Revolution,* St. Paul, MN: Dept. of Soil, Water and Climate, Univ. of Minnesota.], but in most actual cases in which plant growth rates increase, such as the explosion of kudzu in the southeastern U.S., the resulting changes devastate the ecology, agricultural economy, and the appearance of the landscape.
2. Energy secretary Spencer Abraham, March 19, 2001, speech to the U.S. Chamber of Commerce. "Some experts calculate that the demands of the Internet already consume some 8-13% of electricity. If demand grows at just the same pace as during the last decade, we'll need nearly 1,900 new plants by 2020—or more than ninety every year—just to keep pace." Quoted as the "Whopper of the Week" at slate.msn.com
3. "Kyoto and the Internet: The Energy Implications of the Digital Economy," Subcommittee on National Economic Growth, Natural Resources, and Regulatory Affairs of the Committee on Government Reform, House of Representatives, 106th Congress, Second Session, February 2, 2000 http://www.gpo.gov/congress/house/house07.html
4. Angel, J. 2001. "Emerging Technology: Energy Consumption And The New Economy," *Network Magazine,* January,
5. Netcraft Internet Survey, www.netcraft.com/Survey /Reports/
6. Clarke, A.C. 1992. *How the World Was One, Bantam,* p. 83.
7. Koomey, J.G. *et al.* 2000. "Rebuttal to Testimony on 'Kyoto and the Internet: The Energy Implications of the Digital Economy'," LBNL- 46509, Energy Analysis Department, Environmental Energy Technologies Division, Ernest Orlando Lawrence Berkeley National Laboratory, August 2000, enduse.LBL.gov/Projects/InfoTech.html
8. Press release and sales literature from Lucent Technology, www.lucent.com
9. CORD textbook on Laser/Fiber-Optic Communication Systems, Curriculum Morphing Project, Lucent Foundation http://cord.org/cm/leot/Module8/module8.htm
10. Huber, P.W. 1999. "Dig More Coal—the PCs are Coming," *Forbes Magazine,* May.
11. Williams, D.O. "An Oversimplified Overview of Undersea Cable Systems," Information Technology Division, European Laboratory for Particle Physics (CERN), http://davidw.home.-cern.ch/davidw/public/SubCables.html
12. Mills quoted by R. Bryce, "Power Struggle," *ZDNET: Interactive Week,* December 18, 2000.
13. Energy End Use Forecasting, Information Technology and Resource Use http://enduse.lbl.gov/Projects/InfoTech.html
14. Ross, M.H. and Steinmeyer, D. 1990. "Energy for Industry," *Scientific American,* September, p. 89.
15. Koomey, "Rebuttal to Testimony on 'Kyoto and the Internet . . .'"
16. Wald, M.L. 2001. "Clinton Energy-Saving Rules Are Getting a Second Look," *New York Times,* March 31.
17. *Yomiuri.* February 2001. "Touden, sinki hatudensyo keikaku o touketu e" ("Tokyo Electric Power Freezes Plans To Construct New Power Plants"), http://www.yomiuri.co.jp/ ❑❑❑

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ECLECTIC OBSERVER

Compiled by Eugene Mallove

Memory of Water Advances

In our water issue, (*IE* No. 33, p. 55), we reviewed the "Memory of Water" controversy over the *in vitro* experiments by French immunologist Dr. Jacques Benveniste, which purport to show the ability of water to "memorize" the electromagnetic signature of molecules. This could be the basis for the claimed efficacy of homeopathic dilutions, in which the probability of even one molecule of agent surviving a 10^{-30} dilution, is nearly zero.

Now comes news of a significant replication of the Benveniste results by a European research team. As reported in an article by Lionel Milgrom in *The Guardian* (UK) (March 15, 2001, "Thanks for the Memory"), he writes: "A consortium of four independent research laboratories in France, Italy, Belgium, and Holland, led by Professor M. Roberfroid at Belgium's Catholic University of Louvain in Brussels, used a refinement of Benveniste's original experiment that examined another aspect of basophil activation. The team knew that activation of basophil degranulation by aIgE leads to powerful mediators being released, including large amounts of histamine, which sets up a negative feedback cycle that curbs its own release. So the experiment the pan-European team planned involved comparing inhibition of basophil aIgE-induced degranulation with 'ghost' dilutions of histamine against control solutions of pure water."

The entire experiment by the multi-national research team was thoroughly "blinded" to prevent any measurement bias. The results proved shocking to initially highly skeptical participating scientist, Professor Madeleine Ennis of Queen's University Belfast. Three of the teams produced statistically significant results and the fourth team's results were very close to being statistically significant. They employed not only a hand-counting method for the basophils, but a new molecular biology technique that is entirely automated. Writes Milgrom, "The result, shortly to be published in *Inflammation Research*, was the same: histamine solutions, both at pharmacological concentrations and diluted out of existence, lead to statistically significant inhibition of basophil activation by aIgE, confirming previous work in this area." Milgrom opines, "The consequences for science if Benveniste and Ennis are right could be earth shattering, requiring a complete re-evaluation of how we understand the workings of chemistry, biochemistry, and pharmacology." If anything, that is an understatement. As we keep saying to those who trust the tyranny of the Scientific Establishment, especially *Nature* magazine, which attempted to crush Benveniste, "There are more things, Horatio, than are dreamt of in your philosophy."

Noted Cold Fusion Critic Dies

A few days after the twelfth anniversary of the cold fusion announcement in Utah (March 23, 2001), we were informed of the unexpected death of perennial cold fusion critic, Dr. Douglas R.O. Morrison. He was a Scottish-born physicist who had been based at the European nuclear research facility, CERN. His daughter circulated this notice:

Dear Sir, Madam,

It is with great sadness that I inform you that my father, Dr. Douglas R.O. Morrison, passed away on February 25, 2001, after a short illness. Sincerely, Fiona Morrison-Cassidy

Should you need to contact me or our mother please send me an email to my home at: <andrew.cassidy@bluewin.ch>. Thank you.

Photo: Barbara DelloRusso

Dr. Douglas Morrison

Douglas Morrison attended all of the International Conferences on Cold Fusion (ICCF's), beginning with the first one in Salt Lake City in March 1990. He wrote lengthy summaries of these conferences and circulated them on the Internet. Cold fusion researchers regarded these as unfair and filled with errors and misinterpretations. The personally pleasant and friendly Dr. Morrison had become something of a "fixture" at such cold fusion gatherings. He seemed to enjoy the social interaction with the many cold fusion scientists whom he attacked in print. Participants were dismayed at his obstinate questions, which many believed evidenced his inability to understand basic rationales. He continued to make accusations of faulty experimental technique and errors, such as recombination, eight years after these sources of error had been addressed. He participated in an infamous court case against Italian cold fusion scientists in which allegations of fraud arose. His opinions were believed by Dr. Robert L. Park of the American Physical Society and others, who acknowledged Morrison as their eyes and ears on the cold fusion front. Yet Dr. Morrison never personally conducted a cold fusion experiment of his own. He fancied himself an expert on what he termed "pathological science," and he claimed cold fusion was a prime example. His quirky, often humorous comments and presence at such meetings will be missed, but his misinformation will not be missed. My last conversation with him at ICCF-8 in Lerici, Italy, May 2000 was pleasant. We discussed his new-found interest in research into "prions"—deformed proteins thought to be responsible for Mad Cow Disease. In a future issue of *Infinite Energy*, we may attempt a more in-depth assessment of Douglas Morrison's impact on our field. For now, Douglas, *R.I.P.*

Baby Universes

The Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, listed this lecture on its calendar for Wednesday, March 7, 2001:

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12:30 pm: High Energy Astrophysics Division Lunch Talk: "Preserving Civilization into Baby Universes," Dr. Ken Olum, Tufts University, Pratt Conference Room.

Abstract: It appears that every civilization must eventually come to an end because it runs out of energy as the universe expands and cools. However, it is possible that new inflating regions may arise through quantum tunneling, or even be created explicitly. One can imagine sending messages to future civilizations that arise in such regions, or even sending robots whose purpose is to recreate our civilization. In such a way, perhaps civilization can be preserved indefinitely. However, eternal inflation implies that the new regions will have an infinite number of civilizations anyway, and the value of adding one more is not completely clear.

Also "not clear" is why high-energy physicists spend their professional time on such cosmic fantasies, while at the same time they have refused to consider experimental and observational evidence for physics that substantially challenges their self-satisfied world views.

Letter to President George W. Bush

Three days before the twelfth anniversary of the Cold Fusion announcement at the University of Utah, this letter was sent to the White House through President George W. Bush's Press Secretary, Ari Fleischer:

March 20, 2001

Ari Fleischer and President Bush
The White House
1600 Pennsylvania Avenue
Washington, DC 20502

Dear Mr. Fleischer and Mr. President:

I am sending you this letter and enclosed memorandum, as well as a copy of a letter that President Clinton sent to me—very belatedly—on January 18, 2001 in response to that very memorandum, which had been requested by the Clinton White House! Let me explain:

In February 2000, I received at my office a telephone call from a Mr. Shawn Johnson of the White House Office of Communications. He requested that I write a significant memorandum to the President about the topic for which I am most expert—cold fusion and new energy technology. The request was made after our colleague and supporter, Sir Arthur C. Clarke, urged that the President request such a memorandum. Indeed, I prepared the attached 8,500 word memorandum and submitted it to President Clinton, a memo which is now posted on our website. Over ten months went by before I received an acknowledgment from Clinton of any kind, which is somewhat mysterious since it refers to the title of a book that should already be an official document, not a possible new work that the ex-President might decide to edit and publish.

Clinton's delay in responding to me was very annoying and disappointing, since the import of the message is quite clear and precise. The memorandum refers to specific failings of the Department of Energy on this topic, as well as to serious obstructions to public commerce being caused at the U.S. Patent Office. As I write this letter, an appeals case has just made to the U.S. Supreme Court, a case whose history proves conclusively the mistreatment of this very policy issue.

Let me state further that one individual currently being considered for the position of Science Advisor in the new Administration, MIT President Charles Vest, is very seriously implicated in the mishandling of this cold fusion energy issue at MIT, beginning in 1991. This has been amply documented in our internationally circulated magazine (Issue No. 24 in 1999). For that reason alone, I hope the President will not offer him a position. It could later prove embarrassing for the Administration.

I ask of President Bush only one thing, which I do hope he will be able to do quickly, after you, he, and others digest this document. Quoting from the memorandum: "Mr. President, you need to do only one thing now: Publicly state that you are going to investigate this matter and then do it." That is not much to ask, given that the memo contains copious references to Federally funded research, which confirms the thrust of my writing. I do hope that now that we are beyond the various obstructions that occurred in the Clinton-Gore Administration —enumerated to some degree in the memorandum—we will finally get an airing of this most important of issues, one that will dramatically affect the energy, security, and environmental well-being of our country and the world. A new energy revolution will occur no matter what President Bush decides to do with this urgent appeal. However, it would be so much better for our country and the world if he acted expeditiously on this. Remember: I am requesting no special funding for this work, although the Administration, after investigating this, may wish to budget for research. I am only asking that the President state that he is interested in the matter and will investigate it.

Finally, let me state that a certain military branch is quietly funding cold fusion research right now, but for only one or two research groups. I think it is disgraceful that one part of the government is being proactive on this subject, while another part has obstructed legitimate science and commerce at every turn.

I look forward to hearing from you and the President. If there are any additional materials that would help you in your assessment, I stand ready to provide them. I and other scientists in our field would be only too happy to brief the President and his staff.

Sincerely,
Dr. Eugene F. Mallove
Editor-in-Chief, *Infinite Energy* Magazine
Director, New Energy Research Laboratory

U.S. Supreme Court Denies Hearing to Cold Fusion-Related Patent Appeal

On March 22, 2001, the U.S. Supreme Court denied a hearing, without comment, in the appeal of a cold fusion-related patent case of Dr. Mitchell R. Swartz. Dr. Swartz provided *Infinite Energy* with this poignant chronology:

The electrode-vibration patent application was filed in June 1989. The invention at issue in this case, generally speaking, is a method for monitoring the quantity of fuel, such as hydrogen, located internally ("loaded") within a material, such as the metal palladium, as a sponge fills with water.

The Patent was rejected in 1992 and an Appeal to the Board of Patent Appeals was made. It issued a Decision in the Fall of 1999. In its Decision, the Board reversed the examiner's rejections of claims 32 through 43 pursuant to 35U.S.C.§102 (novelty) and 35U.S.C.§103 (non-obviousness).

However, the examiner's rejections of claims 32 through 43 pursuant to 35U.S.C.§112 (operability) and 35U.S.C.§101 (utility) were affirmed.

Of note, the Decision was flawed because the PTO has relied mainly upon reference to art cut of a cloth other than this specification and claims. Only two (2) sentences in the entire Decision of Board pertained to the actual invention. Every Declaration, timely-submitted, was ignored.

The Decision was solely directed over and over with a well-known "carbon-copy" attack on the words "excess heat." However, "excess heat" was never even mentioned in the present original specification and claims. Therefore,

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although one can reasonably assume the PTO thus presented their fabrications "tongue-in-cheek," they were accepted as gospel by the Court.

An appeal was made to the United States Court of Appeals. It decided the case on 11/8/00 by "rubber-stamping" the Office's false statements, such as falsely stating that I did not respond (whereas I did see the picture of the 140 pounds of documents [not shown]), and that MIT proved F-P (Fleischmann and Pons) were wrong because the MIT sensitivity was "10,000,000 times" more sensitive then F-P. The Court ignored the submitted documents showing the Patent Office lied to the Court.

The Court ignored every law, rule, and Declaration submitted. A Petition was filed to the Supreme Court which ignored the entire matter, including that Congress has authorized the patent office to allow patenting of "everything under the sun," which must include measurement of loading.

The Petition was Denied (without comment) on March 19, 2001, after interferences and manipulation by the Patent Office and Robert Park of the APS.

Dr. Swartz wrote this brief note to all those, including this editor, who had offered assistance to Dr. Swartz through the years:

Dear Colleagues and Friends:

I am disappointed to report that The Supreme Court of the United States has denied, without comment, the Petition for Writ of Certiorari. Apparently, interest in justice, energy, United States security, and integrity of Federal government, are not of high interest to the Court on this matter.

I am sorry for this result, after all the effort of so many. Thank you for your support and ideas.

Dr. Mitchell Swartz

Do Muon Experiments Crack the "Standard Model"?

Virtually nothing is more sacred to the physics establishment than the so-called "Standard Model," which describes the hierarchy of subatomic particles and their interrelationships mediated by the "four fundamental forces" of nature. Thus, when on occasion a high-profile experiment seems to cast that esteemed model into doubt on a basic point, all manner teeth-gnashing breaks out. It is quite humorous to watch.

At a press conference at Brookhaven National Laboratory on February 8, 2001 (dubbed a "colloquium"—a paper was *submitted,* that day, *not accepted,* to *Physical Review*), a team of scientists from the U.S., Russia, Germany, and Japan discussed results from the so-called "Muon (g-2) Collaboration," of which project manager Gerry Bunce said, "We are 99% sure that the present Standard Model calculations cannot describe our data." The experiments concern measurements of muon spin and magnetic moment, and their relation to one another—the "g-factor." Opinions raged in the press, for and against the validity of the results. Comments by physicists varied from excitement that "new physics" was being glimpsed to those who were loathe to "tear up thirty years of experiments," which supposedly support the Standard Model. Imagine the spectacle of teeth gnashing when the entire Standard Model is shown to be but a small aspect of a much larger ether-based reality, which has been rigorously ignored and attacked by physics for almost a century!

All the Secrets of the Universe

Fox television in the U.S. recently re-broadcast the May 11, 1999 episode of the sitcom, "Third Rock from the Sun," which featured an ironic exchange between two extraterrestrials. The context of the series is a family of covert aliens, with outward human form, who have awkward adventures within Earth society:

Alien 1 (French Stewart): You wrote a whole book?

Alien 2 (John Lithgow): Only the most brilliant work on physics ever written. The formulas in there are 400 years ahead of this planet's most advanced modern thinking.

A1: Whoa, Dick, you're going to be famous!

A2: Well, yes I am, thank you.

A1: [Reading the book] Cold fusion, perpetual motion. . . Humans are going to be blown away by this!

A2: That will wipe the smugglyness off Strudwick's furry, rat-like, little face!

A1: Every expert in the country's going to be dying to know how you figured all this out. Oh, and the fame! I can't wait to see Barbara Walters make you cry!

A2: Barbara Walters?

A1: Yes, grilling you on national television about your childhood.

A2: Ah. . .Uh. . .I mean, I never *had* a childhood.

A1: Oh, you didn't have to tell me that. Boy grows up awful fast on the mean streets of. . .uh. Where are you from again?

A2: Outer space!! [Throws book manuscript into the trash.] What was I thinking?! If I publish all the secrets of the universe, we might just as well walk into the Pentagon and yell, "We're aliens!"

A1: That would be quite a predicament. . .You idiot!

Artificial Structures on Mars

National Press Club

[Web copies of all images are available for downloading beginning April 5 at: <http://metaresearch.org>. See link to Artificial Structures on Mars on home page. Some features are not visible in printed images at this scale. Web images also make use of color to show keys for original images, which are grayscale only. Larger and higher resolution monitors will bring out the most image details. All original Mars images are from NASA/JPL Viking and Mars Global Surveyor (MGS) spacecraft. MGS images are courtesy of Malin Space Sciences Systems.]

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Technology-Oriented Benefactors and Investors Sought for Cold Fusion, New Energy, and New Physics Projects

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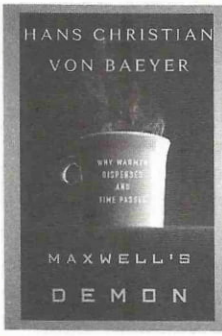
Book Reviews



Maxwell's Demon: Why Warmth Disperses and Time Passes

by Hans Christian von Baeyer
ISBN 0-679-43342-2
$25.00 Hardcover, 207 pp.
Random House, 1998
Review by Eugene F. Mallove

This book will endure as useful documentation of late-twentieth century physics' historical view of the subject of heat and the then very incomplete (and significantly erroneous) science of thermodynamics. The author, Physics Professor Hans Christian von Baeyer of the College of William and Mary in Williamsburg, Virginia, is an eloquent essayist on many scientific matters. His writings, which I have enjoyed, often appear in the attractive science magazine, *The Sciences* (published by the New York Academy of Sciences).

In *Maxwell's Demon*, Prof. von Baeyer gives an historical view of the development of the theory of heat, along with colorful biographical material on the scientists who built it. One can learn a lot from this book, particularly the ways in which a seemingly perfected science can develop and then go astray. A chief theme of the book is the mythical, clever heat "demon," proposed by James Clerk Maxwell in 1874 for heuristic reasons. It has been argued that such a molecule-measuring creature (or device) might be able to reverse the usual flow of heat from hot to cold objects. There have been many variants and proposals for such a demon since it entered the scene. The apparent "impossibility" of such a demon has been used by many, including von Baeyer, to justify what has become a virtually religious devotion to the Second Law of Thermodynamics, a "law" that has evolved from the time of French engineer Sadi Carnot in the early nineteenth century. It is an ironic curiosity that Carnot developed the obstinately persisting "Carnot efficiency" limit $[(T_{high}-T_{low})/T_{high}]$, even though he believed in the erroneous caloric (invisible fluid) theory of heat. Later elaborated by Rudolf Clausius in Germany and Lord Kelvin in England and stated in various seemingly equivalent forms, said Second Law mandates the impossibility of obtaining useful work from a uniform temperature reservoir—and, by extension, the impossibility of machines that can convert heat to work with no losses. Sad to say, the Second Law is at its roots based on the supposition that since no such machine has ever been seen, such an entropy increase-violating device is impossible. In retrospect, this is infantile logic, if ever there was. Having been schooled in thermodynamics as an engineer, until very recently I myself believed the intuitive logic of the Carnot myth.

Von Baeyer states that ". . .Maxwell and his colleagues developed thermodynamics to a state of near perfection, without the help of the demo" (Introduction, p. xx). He writes, "Pure physics won a stunning victory over engineering practice. . . Carnot's theorem is the most impressive example in all of physics of the triumph of theory over praxis, of abstraction over experience. It stands as a monument to the value of pure science—not just to the intellectual endeavor of understanding nature, but directly to the practice of engineering" (p. 44). It turns out that it does no such thing. If anything, Carnot's formulation has been one of the greatest roadblocks to technological progress ever devised.

Later we are told (p. 53), "You can't build a machine for extracting energy out of the ocean or the air any more than you can build a perpetual motion machine! The proof of this disappointing conclusion comes less from failed attempts to beat the Second Law than from countless successful applications of the theory of thermodynamics." Such illogic is breathtaking in its scope, and is testament to the brain-deadness of modern physics. If I may paraphrase the author here: "Because thermodynamics has let us mathematically describe countless applications within technology, and because no one has ever seen a machine extracting energy from the ocean of air, such a machine is impossible." Dear professor, you and your colleagues have simply not looked hard enough. Turn to page 31 in this issue and observe what Dr. Xu Yelin has achieved; and there is more to come.

It is not surprising that an academic, such as Prof. Von Baeyer, would revel in the supposed perfection of thermodynamics. He is simply neither an original thinker nor one who is especially good at investigating the true facts about scientific claims and counterclaims. Witness his assertion (p. 15), "But the real motivation of the seekers after perpetual motion lies beneath such logical niceties. It is the stimulus that in our day inspired the outrageous claims from drawing energy out of solid metals by means of cold fusion. In the hunt for a copious source of energy, the stakes are so immense they dull skeptical analysis." *Au contraire*, Professor. In the quest to defend the status quo in modern academic physics, the search for truth via the method of experiment has been trumped by a passion to prop up theories that have attained the status of religious Absolutes. Fortunately, not everyone believes *that* religion.

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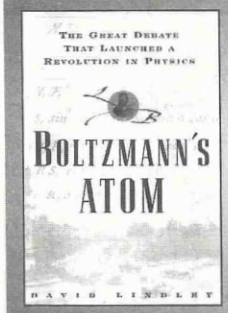

Boltzmann's Atom: The Great Debate That Launched a Revolution in Physics

by David Lindley
ISBN 0-684-85186-5
$24.00 Hardcover, 260 pp.
The Free Press, 2001
Review by Eugene F. Mallove

This work by David Lindley, a Ph.D. physicist and a former Editor at *Nature*, *Science*, and *Science News* magazines, is another historical account of the development of the theory of heat—extending back to the time of the ancient Greeks. In this way it is similar to the approach of *Maxwell's Demon*, but there is much greater biographical richness in Lindley's book. He focuses on the brilliant, troubled life of Austrian physicist Ludwig Boltzmann (1844-1906), who played a major role in introducing statistical methods into the theory of heat during turbulent times in the nineteenth century. Boltzmann traveled to and across America on several occasions to give lectures. He exited an exuberant, tortured life by committing suicide. Readers will likely develop great sympathy for Boltzmann and admiration for his evident genius.

But this is much more than a book about concepts and mathematical theories of heat. Considerable emphasis is given to the rather astonishing battles in the late nineteenth century about the existence of atoms. A school of philosophical thinking, championed by Austrian Ernst Mach, held that atoms were mere mental constructs that physicists should best ignore in favor of merely reporting the macroscopic facts of experiments. Thus, the explanations of pressure and heat in the kinetic theory of gases were looked down upon by Mach and his influential followers. From our vantage point of elaborated chemical knowledge and firm proof that objects called "atoms" and "molecules" really do exist—whatever their formulation and function—it is very hard to understand the anti-atomist view.

That the anti-atomists were so influential until early in the twentieth century is not generally well advertised in science. Lindley exposes the debate and captures the spirit and flavor of that battle very well, especially its effect on convinced atomist Boltzmann. We learn that antagonist Ernst Mach apparently continued his anti-atomism until 1915, dying the following year. MIT Professor Alan Lightman, author of *Einstein's Dreams*, in praise of *Boltzmann's Atom* on its dust jacket, remarks, "[it] shows how modern science has grudgingly come to accept the reality of the invisible world." With that perspective, physics heretics of the late twentieth century and early twenty-first should find encouragement that their ideas and experiments might be accepted in a few more decades!

Some of the quotations unearthed by Lindley are astonishing. We have physics luminary Max Planck publishing in 1882 (p. 115), ". . .the Second Law of the mechanical theory of heat is incompatible with the assumption of finite atoms . . .a variety of present signs seems to me to indicate that atomic theory, despite its great success, will ultimately have to be abandoned." There are intriguing remarks by Irish physicist Edward P. Culverwell in 1890 (p. 112), paraphrased by Lindley, "the problem of explaining thermodynamics had not been resolved, only shunted aside into the unknown properties of the mysterious ether." Now that we are confronted with Reich's discovery of a thermal anomaly in violation of the Second Law and emanating from an energetic ether, this remark appears curiously perceptive.

Lindley offers this fine summary of the era of Boltzmann's life (p. 227): "Apart from Newtonian mechanics, the fundamental elements of classical physics appeared within little more than a fifty year stretch, covering the second half of the nineteenth century. And never within that short span of time was there a period of stability and consensus. Arguments over kinetic theory and its statistical connotations, and over the nature of Maxwell's electromagnetic field, persisted into the beginning of the twentieth century—after quantum theory had put in a fledgling appearance. Boltzmann's lifespan conveniently coincides with the age of classical physics, which was a time of constant debate, evolution and controversy." Oh, would that that spirit return to physics! I think it will.

This is definitely a book well worth studying for its rich historical context and copious references; it includes sixteen pages of notes and bibliography. It has much to teach us about our present age, how we got here, and where we might be going.

Life at the Edge of Science

by Beverly Rubik
ISBN 0-9652401-0-X
$16.00 Paperback, 185 pp.
Institute for Frontier Science, 1996
Review by Mike Carrell

This anthology of essays by Dr. Rubik reflects her passion for a wider view in the study of nature than the reductionist strategies that served the physical sciences well in the last few centuries. She has published and lectured widely on the themes in this book. In 1988, she founded and directed the Center for Frontier Sciences at Temple University in Philadelphia. The Center publishes a journal, *Frontier Perspectives*, and sponsors lectures on cutting edge science topics. She left Temple in 1995 to found the nonprofit Institute for Frontier Science to continue her work.

The book has three sections: Anomalistics, Consciousness Studies, and Biology and Medicine.

In Anomalistics, Dr. Rubik critiques the reductionist strategies of physics as excluding evidence necessary to recognize phenomena that involve larger systems. These are consciousness research, bioelectromagnetics, and complementary medicine. Under these umbrellas a range of "fringe" sciences and practices find defense and nurture.

The essays have themes familiar to readers of *Infinite Energy*. As the essays were written for different audiences, there is repetition among them.

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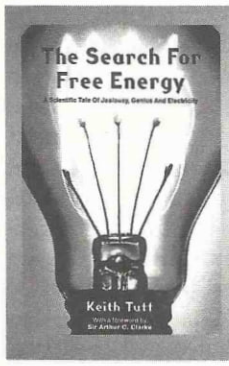

The Search for Free Energy: A Scientific Tale of Jealousy, Genius, and Electricity

by Keith Tutt
Foreword by Sir Arthur C. Clarke
ISBN 0-684-86660-9
£18.99 Hardcover, 354 pp.
Simon and Schuster UK, 2001
Review by Eugene F. Mallove

The universe of credible cold fusion books has expanded since 1991—in temporal sequence: by Mallove, Kozima, Mizuno, and Beaudette. As 2001 dawned, it was time for a book that treats, in adequate depth but generally in overview, not only cold fusion, but a host of past and present claims for anomalous energy devices. Keith Tutt's *The Search for Free Energy*, just released by the U.K. branch of Simon and Schuster, is such a landmark book. I have no doubt that some of the devices considered by the author will become robust free energy technologies early this century—shattering the myths of the naysayers in one of the greatest scientific revolutions of all time.

Keith Tutt, a skilled screenplay writer and science journalist since 1981, has years of experience producing science and environmental documentaries for the BBC, some of them award-winning. His educational background in psychology and philosophy made him well-suited to assess the often eccentric and at times not understandable behavior of the bestiary of free energy scientists, inventors, and occasional fraudsters. This is a very well-written work, which takes up where Jeanne Manning's excellent classic *The Coming Energy Revolution* (1996) left off.

Of this book's twelve chapters, two are devoted to an in-depth look at cold fusion, and if one counts the one devoted to BlackLight Power as part of the cold fusion story as do I, a full one-fourth of the book is cold fusion-related. I am very appreciative that Tutt has exposed to a potentially very large audience the important historical nugget of the scandal against cold fusion at MIT, which was first revealed in detail in *Infinite Energy*. It is an honor for our magazine to have become something of a guiding star to those new to the free energy scene. Keith Tutt, indeed, brings a fresh perspective to the field.

Readers will find excellent treatments of the work of Tesla, T. Henry Moray, and the Thesta-Distatica device of the Merthernitha community in Switzerland. The author records his on-site visit and struggle to assess the claims for this apocryphal power technology. We meet a host of free energy developers of varying quality, such as Stefan Marinov, the Correas, Bruce DePalma, Joseph Newman, and lesser known figures who are familiar to devotees of the field. I agree with the conclusion of Tutt's explorations, "I have no doubt that in the free energy field as a whole only a relatively small percentage of what is claimed is incontrovertibly true." Yet in that category are some of the most important discoveries in history.

Sir Arthur C. Clarke, whose new energy perspective may well be vindicated in this very special year for him, "2001," has written a generous Foreword. Two paragraphs deserve repeating:

> I do not believe that any unbiased reader will put down this book without feeling that something strange is happening at the fringes of physics. Exactly the same thing happened just a century ago, when a new and totally unexpected source of energy was discovered. From Bequerel's 1896 fogged photographic plate to nuclear power took less than fifty years. Now another revolution is urgently needed; let us hope it is even swifter. . .In 1973, when OPEC started to multiply the price of oil, I predicted: "The age of cheap power is over—the age of free power is still fifty years ahead." Now that the price of oil is rising once again, I hope this will be only a slight exaggeration.

May many more books like *The Search for Free Energy* spring forth as the new energy age dawns. For now, Keith Tutt's well-written and carefully researched book could be a wake-up call to the still slumbering "green" movement. One hopes that Tutt's past work in television might make him an effective bridge to the environmental community, which has generally ignored free energy technology in favor of the here-and-now of conventional renewables.

If you would like to contribute articles (1,500 words or less) on renewable or conventional energy, please submit them for consideration to:

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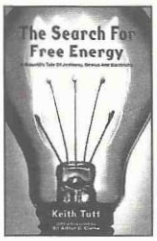
The Search for Free Energy
by Keith Tutt
Foreword by Sir Arthur C. Clarke



"A fascinating and often highly amusing account."
—Sir Arthur C. Clarke

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Butter Side Down

How cold fusion researchers battle the innate perversity of inanimate objects and exploding parameter space

Jed Rothwell

When you drop a piece of buttered toast off a table, it usually lands on the floor butter side down. Robert A.J. Matthews described the reason in a 1995 paper.[1] As toast slides off a plate, friction at the edge produces torque. The toast begins to spin. It makes only one half turn before it reaches the floor. You can demonstrate this with a paperback book. Place it on the edge of a table face up, and gently push it until it tumbles off. Most of the time, it will land face down. Matthews examined the phenomenon more closely, building a "House that Jack Built" chain of cause and effect. The toast makes a half turn because it falls about a meter. Matthews explains:

> . . .If tables were a lot higher—around 3 metres high—the problem of toast landing butter-side down would go away, as the toast would have enough time to complete a full rotation.
>
> *So why are tables the height they are?* Simple: to be convenient for humans.
>
> *So why are humans the height they are?* Using a simple chemical bonding model of the human frame, I show that there is a limit to the safe height for bipedal, essentially cylindrical creatures like humans. The limit is around 3 metres . . . This limit, in turn, sets a maximum height on tables suitable for creatures with human articulation of about 1.5 metres—which is still not high enough to prevent toast from landing butter-side down.

Digging deeper again, he discovers:

> The formula giving the maximum height of humans turns out to contain three so-called "fundamental constants of the universe." The first—the electromagnetic fine-structure constant—determines the strength of the chemical bonds in the skull, while the second—the gravitational fine-structure constant—determines the strength of gravity.

Matthews describes other fundamentals such as the atomic Bohr radius, which "dictates the size of atoms making up the body." In short, he demonstrates it is no accident you usually end up with butter in your carpet. That outcome is built into the fabric of the universe.

Why haven't cold fusion experiments been scaled up? Why haven't researchers learned to make the results stand out? After twelve years of painstaking replication attempts, most experiments produce a fraction of a watt of heat, when they work at all. Such low heat is difficult to measure. It leaves room for honest skeptical doubt that the effect is real. Some experiments have been scaled up successfully, and a few have produced spectacular excess heat for days at a time. Edmund Storms has seen up to 4 watts occasionally, although his cells usually produce no more than a third of a watt. With his new line of research, he hopes to produce a watt or more consistently. If he succeeds he will hold a gala "One What/Watt?" party to celebrate. Ohmori and Mizuno routinely input about 100 watts and output 130 or more (30 watts excess), but the heat is sporadic and difficult to distinguish from the violent fluctuations of glow discharge plasma. Other researchers have seen 5 or 10 watt reactions lasting for many days. Michael McKubre has seen enough high heat to characterize the effect as ". . . neither small nor fleeting."[2] He finds it difficult to bring about the effect, but when it does finally appear, he is certain it is real. Other signatures of cold fusion have occasionally appeared at spectacular levels. Tritium has been measured at hundreds and even thousands of times above background, enough to swamp the detectors in a few cases.

Yet most results are marginal. When more power is applied to a bigger cathode, the reaction refuses to scale up, for unknown reasons. Most experiments are hemmed in by the same basic laws that cause toast to land butter side down. Many limitations are prosaic, such as the scale of the instruments or the maximum electric power an off-the-shelf laboratory power supply generates. Experiments can be made larger, but they would be more difficult to operate, more expensive, and perhaps not as convincing.

Scale is not the only problem. Many researchers are defeated by exploding parameter space. There are countless ways to do an experiment, but only a few that work. A researcher is faced with too many choices, which would take a lifetime to explore. A choice made a year ago may have doomed the project, when someone selected the wrong cathode material. A researcher may not realize he should polish the cathode. The experiment fails without this step, and the rest of the skilled labor poured into the project is in vain. Because there is no accepted theory, progress depends upon wasteful trial and error, and blindly following recommended procedures. To get a sense of how many variations there are, and how long it takes to test them, consider a recent paper by Mizuno.[3] It explores the effect of voltage and electrolyte temperature on heat production in glow discharge electrolysis. To prepare this one paper, and explore these two parameters, Mizuno performed approximately three hundred experimental runs lasting several hours each, including preparation time. He observed excess heat eighty times. Voltage and temperature were systematically varied; all other parameters, such as the cathode material and shape, were held as stable as he could make them. This series of tests took three years. At this pace, a systematic exploration of material composition might take hundreds of man-years.

Many invalid claims are caused by ignorant mistakes. Many researchers have failed to protect against noise, particularly changes in room temperature. This produced embarrassing false positive results at leading laboratories including the NHE, and it may have hidden real excess heat elsewhere. There is no excuse for such mistakes, but they are not surprising. Experts in other fields make similar blunders. Wall Street gurus fell for the dot-com craze. Computer programmers make errors described in introductory textbooks, such

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as badly named variables. This weakness of human nature is why we must see independent replication before we can believe a result.

Most researchers use traditional, water-based calorimeters, which have not improved much since 1900. There are several different kinds, and it is important to select the right one for the job. A limitation or inaccuracy in one type may not be a problem in another. When Mizuno began glow discharge experiments, he used flow calorimetry. The intense radio frequency (RF) noise from the glow discharge affected the thermocouples, so he switched over to a bomb calorimeter for a while. With this method, heat builds up inside a well-insulated cell. Total energy can be computed by comparing temperatures before and after the run, when the RF is not present and cannot affect the measurement. A flow calorimeter can be run indefinitely, for hours or days, whereas a bomb calorimeter reaches its limits in about twenty minutes, after which it either stops storing energy and loses track, or it explodes (hence the name).[4] A bomb calorimeter would not work with a Fleischmann-Pons experiment, which runs for weeks. But the glow discharge runs for only fifteen minutes before the cathode disintegrates, so the short time limit does not matter.

Other Ways to Improve Signal to Noise Ratio

There are other ways to improve results besides making a bigger cathode, but these other techniques soon run into their own set of roadblocks. Background electrolysis power can be reduced by bringing the anode and cathode closer together. Most are only a few millimeters apart, which is about as close as they can be in a handcrafted cell. Background electrolysis power can also be reduced by increasing the concentration of salts in the electrolyte. Many experts feel cathodes would work better at a higher operating temperature, perhaps 80 to 300°C. This calls for a pressurized, sealed cell, which is more complicated and dangerous than a regular glass cell at atmospheric pressure. Many researchers, frustrated by their inability to increase the signal, have concentrated instead on decreasing the noise. They build elaborate and expensive calorimeters. This can become a distraction, draining away time they should devote to improving materials and electrochemistry. Ultimately, researchers hope to find improved methods of making or operating the cells that will boost the cold fusion reaction itself. Conventional electrochemical tricks such as bringing the anode and cathode closer together add nothing to our knowledge of cold fusion.

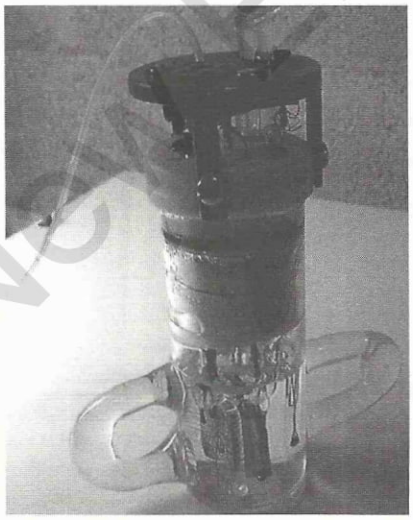

Figure 1. A cell made by E. Storms for a Seebeck calorimeter, with "cooling fins"—tubes extending from the cell filled with electrolyte, which increase surface area. These fins would defeat the purpose with an isoperibolic calorimeter.

Scaling Up Might Not Help

With some cathode materials and calorimeter types, scaling up may actually reduce confidence in the result, even if excess heat increases. Electrolysis input power may increase more than the excess heat, drowning it out. Or the overall heat, including input, may be too high to measure easily.

Some researchers who claim milliwatt reactions with thin film wire are satisfied with their own calorimetry. They say the excess heat signal is strong enough to be measured with confidence. Making it larger would not serve any scientific purpose. They say they are too busy to scale up, and they will make real progress by concentrating on goals such as developing a theory. Others doubt these results, and would prefer to see 10 or 100 times more wire. The devices are the size of a computer chip, and reasonably inexpensive to fabricate, so building a ten by ten array of them would not be out of the question.

Some reactions cannot be scaled up because electrolysis input power would make the cell boil. This is harder to fix than you might imagine. Edmund Storms tried a variety of methods before coming up with a cell for a Seebeck calorimeter with "cooling fins"—tubes extending from the cell filled with electrolyte, which increase surface area (Figure 1). This kind of glassware cannot be purchased. Storms makes much of his own equipment from scratch. He blows his own glass, so he can innovate in ways that researchers who buy materials cannot.

Any method of cooling is likely to take up more room with a bigger cell, which can make the whole apparatus unwieldy. You would not think so, because a cell is a small, hand-held object. Making it a little larger should not matter. But a cell is often placed inside a box, which is inside another box, to shield it from ambient temperature changes. It may be several layers inside, like a wooden Russian nesting doll (Figure 2). When the core object—the cell—grows bigger, the outer containers must grow proportionally. The innermost container is usually a cube 20 to 40 cm per side. Some containers have room to spare for an extra large cell. Others are stuffed with cooling fans, pumps, magnetic stirrers, ambient temperature thermocouples, IR sensors, neutron detectors, and so on. The inside of a Seebeck calorimeter is particularly crowded, because it is expensive real estate. The small Seebeck calorimeter shown in Figure 3 costs $6,000. The innermost chamber is a cube 18 cm on each side. The fan on the right keeps the cell from boiling over. Another method of shielding is to place the cell in a water bath, usually the size of a picnic cooler. Researchers with plenty of money use expensive laboratory-grade baths with precisely controlled temperatures. Researchers working on a shoestring use actual picnic coolers.

Another crowded 18 cm Seebeck calorimeter chamber is shown in Figure 4. It holds an ultrasonic cold fusion reactor, at NERL. There is no room for the oscillator electronics that drive the reactor. The output electrical waveform from the oscillator is complex. A specialized electric meter is being devised to measure it, but in the meantime the oscillator must be placed inside another calorimeter. The experiment would be simpler if both the oscillator and reactor would fit in a single calorimeter. (See p. 39, Device and Process Testing for more details.)

A larger cell with more water will have higher thermal inertia. It will take longer for the cell temperature to change in response to a change in the power level, which means it

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takes longer to calibrate. When the cell grows too large, it may take a full day to establish a single calibration point, and weeks to establish a curve, which is untenable.

After electrolysis finishes, another limitation may crop up. The cathode may not fit inside a scanning electron microscope or element/isotope analyzer. A large cathode may have to be cut in half, which would probably contaminate it, defeating the purpose.

Laboratory equipment is designed for hand-held, hand-made samples. It would be annoying to make samples any larger, or smaller. The picnic coolers, constant temperature baths, power supplies, oscilloscopes, quadrupole mass spectrometers, and so on are made in a size convenient for humans, like the breakfast table. They are small enough to be picked up by middle-aged researchers, and narrow enough to fit through ordinary doors. At Osaka University, ion beam cold fusion experiments are performed with an accelerator 30 meters long. It is housed in a warehouse-sized facility, equipped with overhead cranes that can pick up tons of equipment. Everywhere else, the research is conducted in cramped rooms with manual labor.

At NERL, we have been working on and off for several years to try to test a Hydrosonic Pump™ at our facility. We previously reported our positive results at the HydroDynamics plant.[5] When we initially acquired a factory spare unit, it was 56 kW. This was much too large for our purposes. It made preparations very difficult. We rewired our AC electricity, transformers, and hook ups. There were other problems; the original rotor unit was not matched correctly to the motor, and a replacement rotor unit needs professional precision realignment on a test stand. It would have been much easier and cheaper to test a miniature pump that consumes 10 watts. The test bed at HydroDynamics, Inc. cost tens of thousands of dollars, and it was designed by the former dean of mechanical engineering at the Georgia Institute of Technology. It has been used to demonstrate convincing excess heat. We have not succeeded in getting ready for testing with less rigorous methods and fewer instruments.

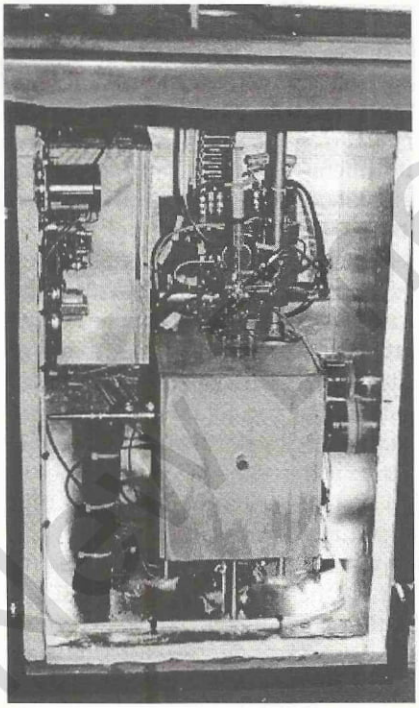

Figure 2. To guard against ambient temperature fluctuations, calorimeters are often arranged with boxes inside of boxes, like wooden Russian nesting dolls (Matrioshka). This calorimeter was actually made of wood, by E. Storms.

Even after you go to the trouble of making a larger cell, and you manage to produce more heat without proportionally increasing the background, the statistical significance of the results may still go downhill. Suppose a flow calorimeter is used to measure 100 watts (including electrolysis). Most off-the-shelf, reasonably priced precision pumps and flow meters work best at flow rates up to ~60 ml per minute. At that rate, the outlet water would be 24° hotter than the inlet, which would degrade accuracy. Most researchers try to limit the difference to about 10°, because water has different properties at elevated temperatures, including a slightly different thermal capacity. Other problems would crop up, because the instruments would have to do two jobs at once: measure heat, and prevent overheating. Instruments designed for multiple purposes are usually not as good as dedicated ones.

In 1991, Tadahiko Mizuno conducted the only large-scale palladium cold fusion experiment on record. It was convincing and dramatic, but also uncontrolled, irreproducible, and probably dangerous. It is described in his book.[6] Most cathodes weigh one gram or less. Mizuno used a 100-gram cathode in a closed cell. During two months of electrolysis, it produced 10 megajoules of excess heat in a normal cold fusion reaction. After electrolysis was turned off, instead of cooling, the cell went into heat after death mode, and threatened to go out of control. It was placed in a large bucket of water. All the water in the bucket evaporated and was replenished four times. Over ten days, the cathode generated another 85 megajoules, evaporating 17.5 liters of water. No one ever again tested such a large piece of palladium. Given the high cost of palladium and the unexpected risk this experiment developed, it would not be prudent. An experiment with 1,000 grams of palladium in a closed cell the size of a shoebox would be foolhardy. It would probably not produce any measurable excess heat, but if it worked as well as Mizuno's cathode, it would briefly produce thousands of watts before exploding violently enough to kill a person. Until cold fusion is better understood, and we can control it with confidence, there can be no thought of scaling up experiments, and certainly no thought of prototype cold fusion generators or motors.

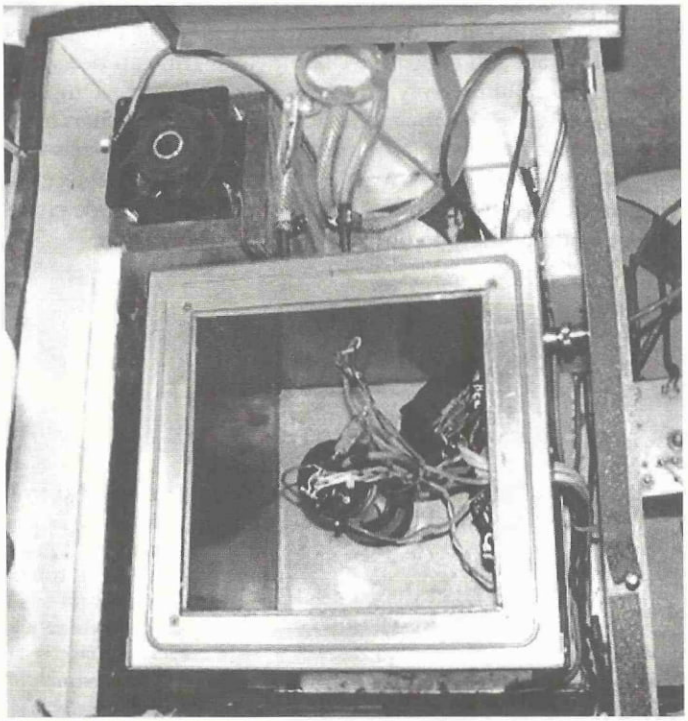

Figure 3. The Seebeck calorimeter used by E. Storms. The cell is placed in the center of the inner chamber, along with a fan. Water from the reservoir circulates through the envelope, keeping the reference temperature constant.

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Practical Limits to Power Supplies and Money

Compared to normal electrochemistry, cold fusion calls for unusually high current density. Ohmori and Mizuno's glow discharge experiments require high voltage. The 200 V maximum of most off-the-shelf power supplies limits the size of the cathode to a plate 5 mm by 10 mm. A much larger cathode, say 20 by 20 mm, might produce much more excess energy, but it would require thousands of volts from a specialized power supply, which Mizuno cannot afford. (Several power supplies might be ganged together, but this would cause other problems.) Standard meters and power supplies are more reliable and easier to acquire than custom-built ones. Most cold fusion research is done on a shoestring. Researchers with middle class incomes or retirement pensions pay for an endless parade of meters, scopes, power supplies, heavy water at $500 to $1,000 per bottle, precious metals, and other materials. The machines pile up on every surface and under the tables. On any given day, most are broken or waiting for a software upgrade (Figure 5).

Many desirable instruments would be too much of a bother to own, even if they cost nothing. They require frequent maintenance and calibration, and they take up too much space. Edmund Storms has often said he wants a Scanning Electron Microscope (SEM). I found a used one on the Internet for $13,800. Unfortunately it is in the Netherlands, and it is fourteen years old. Storms explained that he cannot buy a pig in a poke. He would have to go to Europe to see the machine, and he would have to test it carefully, so it would be better to look for one closer to home. "The problem with old, used equipment is that it generally doesn't work very well, this being the reason it is being sold. . . There is nothing worse than having to fight equipment while also fighting nature."

Not a Zero Sum Game

Every step you take to improve an experiment complicates matters, and in the worst case it may actually work against you, causing larger errors. An experiment resembles a nightmare labyrinth, with an endless series of decision paths that lead to dead ends, or mysteriously double back to the starting point. There is no escape from the maze; it can only be built larger, with even more ways of getting lost. The paths are defined by the laws of nature, by design trade-offs, and by the limitations of money, time, and effort. Yet this does not mean calorimetry is a zero-sum game, without hope of improvement or refinement. It means improvements come at a cost. Sometimes the cost is trivial. Ken Rauen (of the New Energy Research Laboratory) recently dampened background temperature fluctuations from space heating by leaving a large bucket of water under the table. At the opposite extreme, this same problem was fixed more effectively by building Toyota's cold fusion research laboratory with precision heating and air conditioning, which cost hundreds of thousands of dollars. The fan in the Seebeck calorimeter shown in Figure 3 cools the sample and reduces position sensitivity, but the power it consumes must be measured, and this adds to the background noise of the output heat signal. A magnetic stirrer ensures temperature homogeneity, but the spinning magnet and the motor under the cell may add a little heat to the cell. This heat is probably too small to measure, but that fact must be confirmed during calibration.

Different Calorimeter Types, Pros and Cons

Here are some brief, informal descriptions of some calorimeter types often used in cold fusion. For technically rigorous definitions, see a textbook on calorimetry:[7]

Isoperibolic, also called static. The cell consists of a test tube immersed in a bath, or sitting in air. The power level is proportional to the temperature of the electrolyte compared to the surroundings. This is the oldest and most crude method. Improved versions include Pons and Fleischmann's half-silvered Dewar cell, which eliminates the effect of changing electrolyte levels, and the cell designed by Melvin Miles, in which the temperature is measured outside the cell wall, instead of in the fluid.

Reflux boiling. Pons and Fleischmann developed a metal cell to test cathodes held at high temperature, where the input to output ratio is favorable.[8] The electrolyte around the cathode boils continuously, the steam condenses in the upper part of the tube and returns to the lower section. Temperature is measured on the outside of the cell at the bottom where the hot water and cathode are located, and at the top section heated by the steam.

Flow, or mass flow. A stream of water, oil, or other fluid is pumped through an envelope around the cell, or through a coiled tube inside the cell. A fraction of the heat escapes from the cell by radiation from the lid and various other paths, but most is recovered by the flowing water, where it is easily measured by first principles. It equals the flow in milliliters per second multiplied by the specific heat capacity of the fluid (4.18

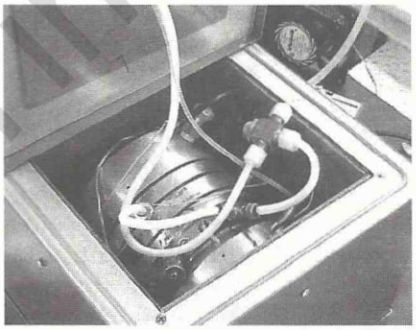

Figure 4. An ultrasonic cold fusion reactor barely fits inside a Seebeck calorimeter, looking a little like a round peg crammed into a square hole. The power supply does not fit, which complicates the calorimetry. This work is being performed at NERL in Bow, New Hampshire.

Figure 5. T. Mizuno (right) and his assistant T. Kawasaki (left) preparing a cell in 1999. In most labs, machines and supplies pile up on every surface and under every table. The day after you throw away a broken machine, you find you need a part that can only be had by scavenging that old, broken machine.

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joules per milliliter for water at room temperature). Although a flow calorimeter is less dependent upon calibrations than other types, it must be calibrated carefully to ensure it is working correctly, and to measure the recovery rate, which ranges from 80% to 98%. The recovery rate should be tested under a variety of conditions to be sure it is consistent.

Flow calorimeters are elegant in principle, but in practice they can be annoying Rube Goldberg contraptions. Expensive flowmeters tend to fill with sand or debris and stop working, so in most long-term experiments, a beaker is set on a precision computerized weight scale and filled by the circulating fluid. The beaker dumps out into the reservoir periodically, either under computer control, or with a siphon close to the top. The circulating water has to be purified, and mildew on the inside of the tubes fought with colloidal silver or bleach. At a certain laboratory, oil was used as the circulating cooling fluid. A hose popped out during the night, and the oil was pumped onto the floor. The next morning, before anyone realized what had happened, a group of distinguished visitors was ushered through on a tour. One of the visitors slipped and fell into the mess.[9]

Bomb calorimeter (see Figure 6). As described above, the one used by Mizuno is a well-insulated container with a liter of electrolyte, which is more than most cells. No insulation is perfect; some heat is lost from the cell during the run, so a bomb calorimeter has some of the characteristics of an isoperibolic calorimeter. In practice, to measure the 30% excess that Mizuno usually observes, he must account for heat lost from the cell during the run. This is easily done, with equations based on the heat decay curve after the run. Some of the spectacularly successful runs would show excess heat even if he ignored this loss, but most would come out negative. Mizuno used the bomb configuration to demonstrate that although RF does affect performance, it makes little difference. Temperature readings during the run show the heat accumulating in spurts at times when the plasma covers the cathode surface. By comparing the last data point before the power goes off to the first one after it is off, Mizuno shows that RF lowers the temperature reading slightly.

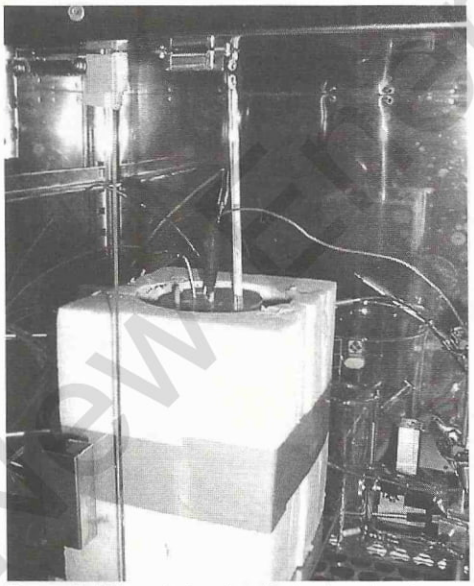

Figure 6. Mizuno's bomb calorimeter placed on a magnetic stirrer inside an air-cooled incubator. It is an ordinary Pyrex 1-liter beaker encased in Styrofoam. The mercury thermometer at the top confirms the thermocouple readings.

Boil-off. This is Ohmori's technique for measuring heat from the glow discharge reaction. A cell with an open top containing about 200 milliliters of electrolyte is placed on a precision digital weight scale. The entire cell, including the electrolyte, weighs just over 300 grams. Weight is recorded periodically in a lab notebook. After glow discharge begins, the water in the cell boils rapidly. In a 20-minute run I observed, the weight fell from 316 to 282 grams. The 34 grams of lost water is multiplied by the heat of vaporization of water to determine how much heat was carried off. After power is turned off, the heat decay curve is used to determine how much energy radiates from the cell while the water boils. Total enthalpy equals heat carried off by vapor plus heat radiated.

These calorimeter types are not absolute. They overlap. One type may be made over into another, sometimes merely by moving a few tubes, turning off a pump, or repositioning the temperature sensors. An isoperibolic and flow calorimeter can be combined in what Scott Little calls a "dual mode" calorimeter.[10] However, changes in the electrolyte temperature will be small because most of the heat is removed by the cooling fluid, and the ratio of electrolyte temperature to heat will be unpredictable if you adjust the flow rate, so this method has limited value.

The Seebeck envelope, or Calvet calorimeter, is a radically different design. The instruments listed above are based on the specific heat of water, oil, or some other fluid. A Seebeck calorimeter is fully electronic. It is a cube with specially made inside walls, an envelope, and a steel shell on the outside. Embedded in the six inside walls are thousands of Seebeck effect thermocouples, linked electrically in series. When an object inside the box emits heat, it causes voltage to flow through the chain of thermocouples. Theoretically, it does not matter where the object is located in the box; the voltage should be the same for a given power level. In actual tests Seebeck calorimeters are found to be slightly position sensitive, so care should be taken to place the sample in the same spot in every test, close to the center of the cube. A Seebeck calorimeter is sensitive to small changes in power levels. It is stable and convenient to work with. It has a fantastic dynamic range, from milliwatts to hundreds of watts. The operating temperature ranges over hundreds of degrees; you can put the Seebeck box itself inside a refrigerator or an oven and it will still accurately track the power level of the sample. Like an isoperibolic calorimeter, a Seebeck depends upon calibrations, not first principle calculations. You run an electric heater inside the box at 1 watt, then 2, 3, and 4 watts to determine how much voltage each watt of heat produces: the calibration constant. This takes a day or two. Unfortunately, this calibration constant changes every time you remove the lid and bolt it back on again. It may shift as much as 100 milliwatts from one run to the next, although the value is never far from the mean for all runs. For maximum accuracy, the Seebeck must be recalibrated for every run. This is time-consuming, especially when an experiment requires that the cell be taken out of the box, tested, and then put back in again several times.

Seebeck calorimeters can be scaled up to practically any size. Some are big enough to hold adult human beings. One of the first confirmations of cold fusion was performed by Richard Oriani using a Seebeck designed to hold a baby.[11] However, even the smallest models are expensive.

Although Seebeck calorimeters are not dependent upon the specific heat of water, water from a constant temperature bath may be circulated through the envelope to create a uniform background reference temperature, as shown in Figure 3. There is no need to keep track of the circulation flow rate. A small number of precision thermocouples are used with other calorimeter types. Thousands are used in the Seebeck

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calorimeter, which is why it costs more. Despite the expense, years ago Ben Bush enthusiastically recommended Seebeck calorimeters made by Thermonetics, Inc.[12] They were later used successfully by John Dash,[13] Edmund Storms,[14] and Michael McKubre.[15] W.-S. Zhang *et al.* have successfully used Seebeck calorimeters made in Sweden.[16]

Main Sources of Error

Edmund Storms says the following main sources of error affect various types of calorimeters. These problems are listed in the order of importance:

Single-wall Isoperibolic

1. Inability to know the average interior temperature. This can be fixed by measuring the temperature at the cell wall, instead of in the fluid.

2. Variations in the external environment temperature. This can be controlled with reasonably inexpensive techniques, such as a flowing water envelope or an air envelope (a large box) regulated with precision thermostats. The temperature can be held to within 0.01°C in air, or 0.001°C in water.

3. Variations in the thermal conductivity of the thermal barrier. The material should be carefully selected.

5. Variations in the stability of the thermistor temperature readings. More expensive instruments are called for, if more precision is needed.

Flow-type

1. Variations in flow rate, real or imaginary. Real variations occur when the pump wears out, or the tubes are blocked by debris. Imaginary variations occur when the flow meter malfunctions. With practice, you can tell these apart. It can be challenging when the flow really does change and the flowmeter goes haywire at the same time.

2. Inhomogeniety in the temperature of the jacket.

3. Variations in the stability of the thermistor temperature readings.

These problems can be ameliorated with more expensive instruments.

Seebeck

1. Variations in the Seebeck voltage caused by nonuniform temperature within the envelope.

2. Variations in the reference temperature.

Wishful Thinking and Pathological Science Do Exist

The skeptics are partly right when they describe cold fusion as fulfilling some of Irving Langmuir's criteria for pathological science: "the maximum effect that is observed is produced by a positive agent of barely detectable intensity . . . The effect is of a magnitude that remains close to limit of detectability, or many measurements are necessary because of the very low statistical significance of the results." This describes some cold fusion experiments, although fortunately others have produced dramatic, incontrovertible evidence. Some marginal results may be real, but those which cannot be reproduced in other labs are possibly caused by random noise and wishful thinking.

Having acknowledged this, let us note that Langmuir's characteristic is normal for many fields, such as epidemiology. Some mainstream physics experiments yield a definite yes or no answer, but others produce only a statistical probability. The confirmation of the top quark is a good example of the latter. It was based upon a few barely detectable events, out of several billion collisions. The experiment cannot be reproduced at other laboratories because it is so difficult, and it would require building another giant multi-billion dollar complex like Fermilab's Collider Detector Facility (CDF). The public relations section of Fermilab explains:[17,18]

> The discovery of the top quark was not a "Eureka" event—not the sudden sighting of the long-sought particle. "We discovered the top quark not in one lightning stroke, but over a long period of time, event by event," says physicist Nick Hadley, a DZero collaborator. "No single piece of evidence, no matter how strong, was enough to let us claim a discovery. We couldn't be sure we had found the top quark until we had seen so many events with the right characteristics that there was almost no chance the statistics were fooling us into making a false claim."

Many famous experiments which the history books say produced a clear-cut answer were actually based on statistics. The 1919 observations of a solar eclipse "confirmed" the General Theory of Relativity, by showing that light is displaced by the gravity of the sun. Einstein predicted a displacement of 1.7 arc-seconds. However, an older Newtonian theory also predicted a shift, of 0.84 arc-seconds. Observations were made from two locations. At one, eight good quality photographs were taken, with a mean value of 1.98, and eighteen poor quality plates were made with a mean value of 0.86. At the second site, two poor quality plates were made, with a mean value of 1.62. It seems like a split decision, but Eddington showed that the good photographs supported Einstein. Presumably he did not data select, defining "a good plate" as "one that supports relativity."[19] [*Editor's Note:* There will be much more on this in the next two issues of *IE*, which will be devoted to a reassessment of Einstein.]

Most cold fusion experiments must be repeated many times because the effect is difficult to detect, and calorimetric errors and artifacts are more common than researchers realize. You can only feel confidence the heat is real when you have seen it many times, and taken steps to ensure it is real.

Using Different Techniques and Different Instruments to Guard Against Artifacts

When an experiment is repeated ten, twenty, or hundreds of times and several excess heat events occur, the researcher has several opportunities to verify the heat. Even though most of the runs are duds, the cumulative verification of many positive tests is reassuring. Heat which is only measured once in 100 test runs would make me nervous, even if it showed up that one time with a high signal to noise ratio. When heat appears, a good experimentalist—who has been trying for weeks to make it come—will shift gears and try to make it go away instead. He may gently shake or agitate the cell. Artifactual heat from a thermal gradient will vanish; real heat will remain. He will look for negative heat excursions, in which the temperature drops below the calibration point. This "anomalous cold" proves the instruments are malfunctioning, because a large burst of anomalous cold violates the laws of thermodynamics.[20] (Small bursts can come from limited, weak endothermic chemical reactions.) The NHE managers thought the cells made by Fleischmann and Melvin Miles were producing anomalous cold, because they accidentally calibrated after excess heat began. They set the calibration curve about 100 milliwatts above the actual zero line. Mistakes can cut both ways, producing false excess, or hiding real excess.

An experienced experimentalist looks for signs that the heat is real. The heat should look like it is coming from a badly controlled natural phenomenon, like a fire in a jum-

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ble of wet firewood. It should be unpredictable and unresponsive. It should not correlate well with any single control parameter. When heat correlates with current density in a fixed ratio, and it tracks changes in the current the moment they occur, it is almost certainly an artifact. With real cold fusion heat, when you increase current, the heat does nothing at first. A half-hour later, or perhaps the next day, it may increase, but then again it may not. Current has an indirect controlling effect on the reaction. When other conditions are right, higher current increases loading, which changes surface conditions, which may intensify the reaction. There are other telltale signs of an artifact. Heat that always climbs to 320 milliwatts and stays there, describing a straight line on the graph, is an artifact. Heat that builds up steadily despite changes in current and other control parameters is probably caused by instrument drift.

The best way to confirm heat is to use a different calorimeter. Unfortunately, few scientists do this. Melvin Miles brought cathodes from China Lake to the NHE laboratory in Hokkaido. After they were cleaned up, the ones that worked in California still produced excess, and the ones that did work before still did not work. Storms uses three kinds of calorimeter: isoperibolic, flow, and Seebeck. When he moves cathodes from one to another he sees similar responses from all three, but not precisely the same. This is very reassuring. Mizuno changed the calorimeter configuration as many different ways as he could, and he confirmed excess heat with every configuration.

Mizuno conducted hundreds of glow discharge experiments with flow calorimetry, while holding conditions as closely similar as he could. He varied only the parameters he wished to explore. Later, to verify the effect was real, he performed additional runs while changing the calorimeter from flow, to isoperibolic, to a bomb calorimeter, and then back to a flow arrangement with improved instruments. Many of the runs with the new configurations showed excess heat at the same level it was observed with flow calorimetry. With glow discharge, the most difficult parameter to measure is input power. Mizuno switched in and out three different power meters, including a new model, top-of-the-line Yokogawa PZ4000 meter the manufacturer recommended for this kind of noisy signal. He installed redundant methods of measuring every parameter: he measures input power with one or two recording power meters and with a general purpose computer interface board. The results agree to within a fraction of a percent. He measures temperature with high precision platinum RTD (resistance temperature devices) and mercury thermometers. They agree to the smallest marked unit on the mercury thermometer. When different instruments based on different physical principles give the same answer, this enhances one's confidence in the results. No one should have blind faith in instruments. Every reasonable step must be taken to confirm them. There is no such thing as the best way to measure heat. Every method has advantages and disadvantages, which sometime counterbalance one another.

Every Model Is an Approximation

Ohmori's glow discharge cathodes produce so much heat, he has the luxury of using a simple formula. In the boil-off method, he multiplies the mass of vaporized water by 540 calories per gram, and adds in the radiation losses based on the heat decay curve. In other runs he uses simple isoperibolic calorimetry, based on a first approximation taught in fourth grade science classes:

Power = Delta T temperature * conversion factor

The conversion factor is determined by calibrating with a joule heater. The curve is straight at first: where 1 watt causes a 3° temperature elevation, 2 watts make it go up 6°, and 3 watts 9°. At 5 watts, the temperature is 15° above room temperature, or ~35°C. Significant heat is lost to water vapor, and the calibration curve starts to bend. You can still correlate temperature to power, but you must work up a more detailed model that correctly matches the shape of the curve. For example, here is Pons and Fleischmann's model for their modified Dewar cell, translated by them from their differential equation:[21]

> Change in the enthalpy content of the calorimeter = enthalpy input due to electrolysis - enthalpy content of the gas stream + excess enthalpy + calibration pulse energy + time dependent heat transfer coefficient * effect of radiation + effect of conduction.

Each of these terms is broken down into component parts in the actual equation. For example, the enthalpy content of the gas stream is defined as:

> 0.75 * (Partial pressure/Atmospheric pressure - Partial pressure) * Enthalpy of evaporation, which is measured in Joules * Degrees Kelvin ^-1 * mol^-1.

The calibration curve does not go straight up indefinitely, and it does not go straight down to zero, either. It never intercepts the origin (0, 0). The instruments always register some level of voltage. Figure 7 from Melvin Miles[22] shows that below a half-watt, linear predictability breaks down. The problem is not in the instruments. The model itself begins to fail at low power. Complexities that made no difference at 1 or 2 watts now begin to crowd in. In cells without a magnetic stirrer, inhomogeneity may become a problem. Because there is a source of heat in the water, the water temperature is different from one spot to another. The thermocouple or thermistor may not measure the average temperature. As power and temperature drop, the water becomes quiescent. Thermal gradients may develop, as warm water rises to the top and stays there, no longer mixed by convection. Areas of stale, unmoving water may develop next to the cell walls. Depending upon where the thermocouple is placed it may read too low or too high, and it may fluctuate back and forth. At very low power levels, reactions within

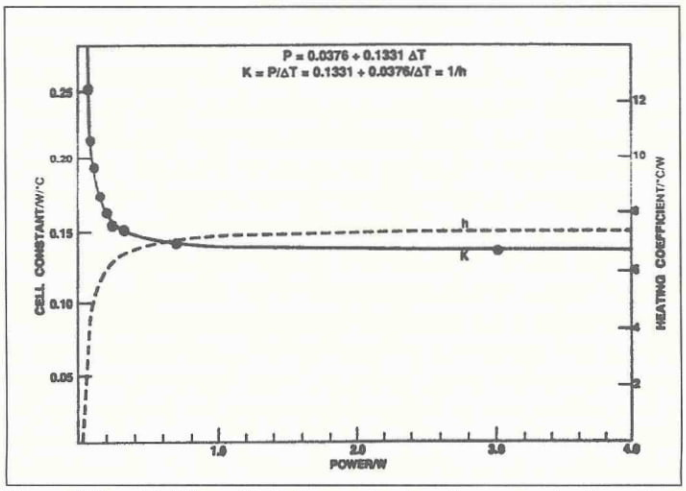

Figure 7. From M. Miles: effect of power level on the apparent cell constant (*K*) and heat-transfer coefficient (*h*).

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the thermocouple or the power supplied to the thermistor begin to play a major role.

As power falls lower and lower, you model the cell in more detail. You must employ better statistical techniques. Below a certain power level, perhaps 10 milliwatts, you reach the end of known physics. The model stops working, the textbooks no longer help.

In other fields of science, researchers have developed microcalorimeters capable of detecting heat at micro-watt levels, to measure things such as insect metabolism. They are nothing like traditional water-based calorimeters. They would probably not be suitable for cold fusion, with its high background from electrolysis power. Most microcalorimeters only have room for a 1 ml sample, and they can only measure at the micro-watt level; they would be overwhelmed by a 20 watt signal.[23] Microcalorimeters in astronomical applications can measure the impact of a single X-ray photon on a detector, with 7 electron-volt resolution.[24]

Cold Fusion Is Not About Calorimetry, But This Essay Is

The focus of this essay is calorimetry, first because the subject is easier for me to understand and explain than electrochemistry, materials or nuclear science. Second, calorimetry is at the heart of most experiments, and it has tripped up many unwary researchers. The calorimeter plays an active role in an experiment. A researcher must choose between many different calorimeter types. Some researchers feel that the wrong choice will interfere with the reaction, by keeping the cathode at room temperature. This prevents what Martin Fleischmann calls "positive feedback," in which the cathode heats itself.

Despite the difficulties described here, calorimetry is actually the easiest part. The real challenge is materials, electrochemistry, nuclear measurements and, of course, theory. To put it another way, this essay hardly begins to describe all the ways a person can botch a cold fusion experiment.

Large bursts of excess heat have occurred in many different laboratories, often enough that we can be sure they do exist. Since they happen occasionally now, there must be a way to make them happen every time.

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References

1. Matthews, R. 1995. "Tumbling Toast, Murphy's Law, and the Fundamental Constants," *European Journal of Physics*, 16, 172-176.

2. McKubre, M. *et al.* 1994. *Development of Advanced Concepts for Nuclear Processes in Deuterated Metals*, EPRI TR-104195, Research Project 3170-01, Final Report, August, 3A-19.

3. *Jap. Journal of Applied Physics*. 2000, Pt. 1, 39, 10, 6060.

4. Mizuno's bomb calorimeter is glass surrounded by Styrofoam. There is no danger it will explode. The term is more often used to describe a rugged, steel cell used to measure the heat of combustion and other rapid chemical reactions. "Calorimeters of this type were soon given the name 'bomb calorimeter' because of the frequent explosion-like course of the reactions involved." - Hemminger and Hohne, Reference 7, p. 177. College coursework instructions advise extreme caution. http://www-ec.njit.edu/~grow/Bombcal/Bomb Calorimeter.html

5. Rothwell, J. 1996. "Notes on Talks by James Griggs," *Infinite Energy*, 1, 5/6, 25.

6. Mizuno, T. 1998. *Nuclear Transmutation: The Reality of Cold Fusion*, Infinite Energy Press.

7. Hemminger, W. and Hohne, G. 1984. *Calorimetry: Fundamentals and Practice*, Verlag Chemie, is considered one of the best, but unfortunately it is out of print.

8. Roulette, T., Roulette, J., and Pons, S. 1996. "Results of Icarus 9 Experiments Run at IMRA Europe," *Progress in New Hydrogen Energy, Proceedings of the Sixth Internat. Conf. on Cold Fusion* (ICCF6), New Energy and Industrial Technology Development Organization.

9. Since the laboratory does excellent work and no one can be blamed for this sort of accident, it seems unkind to mention the name.

10. Storms, E. 2000. "Description of a Dual Calorimeter," *Infinite Energy*, 6, 34, 22.

11. Oriani, R. 1996. Lecture at Hokkaido National University, October.

12. http://www.electriciti.com/~thermo/tc.html

13. Warner, J. and Dash, J. 2000. "Heat Produced During the Electrolysis of D_2O with Titanium Cathodes," *Proceedings of the Eighth Internat. Conf. on Cold Fusion (ICCF8)*, Societa Italiana De Fisica, p. 161.

14. http://home.netcom.com/~storms2/index.html

15. McKubre, M., Tanzella, F., Tripodi, P., and Hagelstein, P. 2000. "The Emergence of a Coherent Explanation for Anomalies Observed in D/Pd and H/Pd Systems: Evidence for ^4He and ^3He Production," *Proceedings of the Eighth Internat. Conf. on Cold Fusion (ICCF8)*, Societa Italiana De Fisica, p. 3.

16. Zhang, Z.-L., Zhang, W.-S., Zhong, M.-H., and Tan, F. 2000. "Measurements of Excess Heat in the Open Pd/D_2O Electrolytic System by the Calvet Calorimetry," *Proceedings of the Eighth Internat. Conf. on Cold Fusion (ICCF8)*, Societa Italiana De Fisica, p. 91.

17. http://www.fnal.gov/pub/inquiring/physics/discoveries/top_quark_background/top95_how_do_we_know.html

18. I asked Robert Park of the APS whether he considers the Top Quark finding "pathological," since it is irreproducible and it fits several of Langmuir's criteria. He did not respond.

19. Collins, H. and Pinch, T. 1993. *The Golem*, Cambridge University Press, 49.

20. Other authors in this issue question the laws of thermodynamics, but I have no doubt these laws are correct. In any case, the apparatus they describe are nothing like electrochemical cells.

21. Fleischmann, M. and Pons, S. 1993. "Calorimetry of the Pd D_2O System: From Simplicity via Complications to Simplicity," *Proceedings of the Third International Conf. on Cold Fusion* (ICCF3), Universal Academy Press.

22. Miles, M.H., Bush, B., and Stilwell, D. 1994. "Calorimetric Principles and Problems in Measurements of Excess Power During Pd-D_2O Electrolysis," *J. Phys. Chem.*, 98, 1948-1952.

23. A micro-calorimeter large enough to fit a 200 g sample is being developed. See: http://www.irl.cri.nz/t830/services/microcal.htm

24. http://hea-www.harvard.edu/~juda/microcal/microcal.html

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Five Frozen Needles QRT/CF Protocol

Robert W. Bass*

The following protocol is designed to be intuitively convincing to a layman who, if told that needles 2, 3, and 4 have been pulsed with constant-voltage DC-electricity for *twice*, *thrice*, and *quadruple* the amount of time as needle 1, and then measured to contain twice, thrice, and quadruple the amount of He^4 as the first needle, will instantly reject any doubt that the electrical pulse was creating He^4 from some form of nuclear-chemistry process whose action was directly *proportional* to the amount of DC electrical energy used. At the same time, the protocol is sufficiently statistically sophisticated in its rigorous application of Experiment Design theory as to satisfy the most skeptical and informed critic.

Step 1: Prepare a strip-shaped cathode of CF-suitable palladium, sufficiently wide that after freezing it can be cut conveniently into five parallel "needles," each of which may be presumed to have been identically-loaded prior to freezing and cutting.

Hint 1: Note published caveats of Edmund Storms and Dennis Cravens regarding suitable versus unsuitable choices of materials.

Step 2: Gently load said cathode with deuterium in a Fleischmann-Pons electrolytic-cell manner, until *beta phase* is attained and cathode becomes $Pd.D_x$, loading-ratio x as close as possible to 1.0.

Hint 2.1: Recall Michael McKubre's resistivity test for assurance of at least 90% of full loading, as well as Fritz Will's volumetric-swelling test and Storms' pressure-changes and weight-changes tests; also note the many published warnings of Cravens and Storms regarding various potentially fatal mistakes to avoid.
Hint 2.2: Storms has kindly supplied the following additional comments regarding Step 2:

> Here is some clarification about measuring composition.
>
> Swelling: The material does not swell in a uniform manner. The length expands in a different manner than the width. This swelling is not uniquely related to composition because it is influenced by formation of cracks.
>
> Resistivity: This requires attaching leads to the sample. The resistivity ratio is also not unique to the composition because the shape of the sample and formation of cracks have an influence. The method is very useful because it can give a relative, real-time measurement of composition while the sample is in the cell.
>
> Orphaned oxygen: The oxygen released when hydrogen goes into the sample can be measured using several methods. My method uses the weight of oil displaced from a reservoir by the change in pressure. This method is accurate to ±0.001 moles of D.
>
> Weight: Weight can be easily measured to ±0.00005g (±0.00002 moles D) by weighing as a function of time after the current is stopped and extrapolating to zero time.

Step 3. Quick-freeze said cathode by sudden pouring of liquid nitrogen upon it (*in situ*, to inhibit de-loading), and thereafter maintain the *loaded* $Pd.D_x$ cathode frozen.
Hint 3.1: See paper by John Bockris *et al.*, *J. Electroanal. Chem.*, 338 (1992), 189-212, who pioneered this important freezing technique, and found "massive" amounts of He^4 in a cathode that had been producing excess heat!
Hint 3.2: Storms notes that if it is not required to keep the sample frozen for more than a couple of weeks, the same objective can be accomplished by freezing in dry ice.

Step 4. Cut or saw frozen $Pd.D_x$ slab into five parallel "needles," keeping them frozen. Number the needles from 0 to 4. (Needle 0 will be the unprocessed blank control sample.)

Step 5. Attach electrodes to bottom and top of k_{th} needle ($k = 0, 1, 2, 3, 4$), and pulse electrically for times of duration $t_k = k.\tau$ (for a preselected duration-epoch τ seconds), with a preselected fixed current of I amperes, at a preselected potential difference $E_{100} = 17.7$ volts.

Note: According to the Turner-Bush-Bass *Resonant Transparency Spectrum* [*Abstracts*, ICCF5] this provides the energy-level $n = 100$, above ZPF ground-state, of *Coulomb Barrier transparency*. (It is assumed here that the engineering unit of "volts" in the MKS system is the same as in theoretical physics, as implied by a paper of Yeong Kim in *Proceedings*, ICCF1). The *low-energy* quantum number $n = 100$ is chosen because the line-broadening created by lattice-ZPF is more than 50% of the distance to the next line and close to maximum over the computed Spectrum (Bass) for $n = 1$ to $n = 600$, during which the energy level in eV ranges from about 6.3 eV to 145.2 eV [with numerical accuracy increasing with n]; this is based upon a *periodic* Coulomb-Madelung/Fermi-Thomas/Mott lattice potential whose validity has been *confirmed* in that it correctly *predicts* the strictly *empirical Schwinger Ratio* within 0.3% of its *measured* value. The optimal values of time τ and current I must be found by trial and error.

Step 6: Cut or saw each needle in halves (or thirds) and send all 10 (or 15) pieces, in a double-blind protocol, to *independent* test labs for physical, chemical assays of He^4 content by every known measurement technique, the more accurate the better.

Hint: Upon request Brian Oliver of Pacific Northwest National Labs (PNNL) [who, while at Rockwell, pioneered the commonly-accepted definitive test procedure in which palladium cathodes were *fully* ionized before the application of mass spectroscopy measurement to the resultant plasma] will supply a three-page statement entitled *Helium Analysis Procedures and Conditions*, which also contains pricing information for both governmental and non-government PNNL customers seeking such tests.

Step 7: Evaluate results by assigning He^4 amounts of A_k for k_{th} needle ($k = 0, 1, 2, 3, 4$).

Step 8: [See *Derivation* below.] Define *mean bias-error* dA, *mean increment-factor* δA, and estimated increment-factor *standard deviation* σ by

$$dA = (3A_0 + 2A_1 + A_2 - A_4)/5,$$

$$\delta A = (-2A_0 - A_1 + A_3 + 2A_4)/10,$$

$$\sigma^2 = (1/3) \sum_{k=0}^{4} (A_k - dA - k.\delta A)^2.$$

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Step 9: Judge experiment *successful* if

$$dA \ll \delta A,$$

and also

$$\sigma \ll \delta A/2,$$

in which case [see *Proof* below] one *concludes* that with greater than 95% confidence

$$A_k/\delta A = k, \quad (k = 0, 1, 2, 3, 4),$$

which implies unambiguously that the amount of He^4 freshly created in the D-loaded palladium cathode is *proportional* to the number of deuterons in the deuterium lattice raised to the energy level E_{100}.

Derivation: Define

$$\Sigma_0 = A_0 + A_1 + A_2 + A_3 + A_4,$$

$$\Sigma_1 = A_1 + 2A_2 + 3A_3 + 4A_4,$$

and differentiate σ^2 with respect to dA and δA and set both expressions to zero to obtain

$$dA + 2\delta A = \Sigma_0/5,$$

$$dA + 3\delta A = \Sigma_1/10,$$

which are trivial to solve in the form

$$\delta A = (\Sigma_1 - 2\Sigma_0)/10,$$

$$dA = (3\Sigma_0 - \Sigma_1)/5,$$

which may be readily identified with the form originally claimed.

Proof: The reader can learn enough about statistics by reading *The Cartoon Guide to Statistics* by Larry Gonick and Woolcott Smith (HarperCollins, 1993), to verify that the preceding provides the result claimed at the 95% confidence level. I showed my one-page proof to an internationally reputable expert in statistics and he agreed that it was correct and said that if the experiment turns out as I *predict* then he will give me a certificate that the confidence level is that asserted and be willing to testify in court as an expert witness that according to accepted principles of statistics the preceding protocol is definitive as stated.

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In Memoriam

File photo

Dr. Shiuji Inomata, 1999

Dr. Shiuji Inomata, President of the Japan Psychotronics Institute, suddenly passed away on the morning of April 17 in a hospital near his residence in Niigata, Japan, from multiple organ failure associated with liver cancer. He was sixty-eight years of age. Dr. Inomata graduated from the Electronics and Telecommunication Engineering University in Tokyo in physics and engineering. He acquired a Ph.D. from the Tokyo Institute of Technology. He worked as a postdoctoral scientist at MIT. Dr. Inomata was a courageous leader and pioneer of new paradigm science, in his work in theory and experiment. He derived new mathematical formulas with a function representing consciousness in the equations of physics, and proposed a "consciousness-energy-matter" triangle that helps us understand how physical energy manifests from the quantum vacuum. He also developed several versions of the N-machine, a device for generating new energy. In the 1990s, with the Japan Psychotronics Institute, he hosted several landmark international symposia in Japan on new paradigm science, including one at Waseda University in Tokyo. Dr. Inomata also launched a committee within the MITI (Ministry of International Trade and Industry) in Japan to explore new energy, or ki. Even though he did not live more than a short time in this millennium, he was a new-millennium scientist. Throughout the world, all of us engaged in the new science, especially in new energy and consciousness studies, mourn his loss.

Beverly Rubik, Ph.D.
Institute for Frontier Science
Oakland, California

You will observe with concern how long a useful truth may be known and exist, before it is generally received and practiced on. —Benjamin Franklin

Submitted by Dean Musgrave

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Flying Machines in the Future

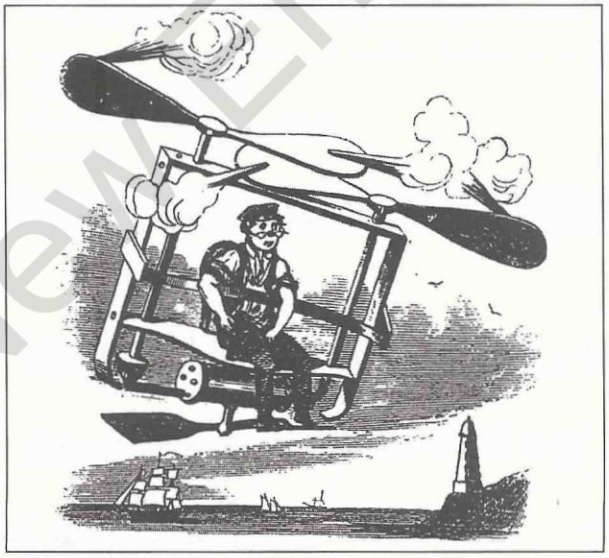
Reprinted from *Scientific American,* September 8, 1860.

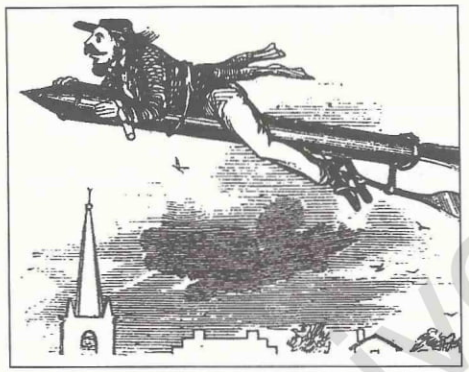
Editor's Introduction:

"The more things change the more they stay the same" comes to mind reading these two delightful mid-nineteenth century speculations about "impossible" heavier-than-air flight. The long and ultimately successful dream of bird-like flight came about decades later, after many dead-end attempts. The spirit and ferment of "aerial navigation" ideas then resembles the worldwide free energy area of today. And, the goal was no less lofty–"free movement" was as unthinkably distant then as "free energy" may seem to some today. Would that Scientific American of 2001 were as bold as its courageous editors evidently were in 1860 about the dream of flight! If so, they would report the attempts to perfect cold fusion and other new energy devices. True to my analogy, the "Bird-Woman" piece even embodies the apocryphal story of success, so evident today in new energy circles. Of course, we know that at least some of our "bird-women" are, indeed, real. –*EFM*

Of all inventions of which it is possible to conceive in the future, there is none which so captivates the imagination as that of a flying machine. The power of rising up into the air, and rushing in any direction desired at the rate of a mile or more in a minute, is a power for which mankind would be willing to pay very liberally. What a luxurious mode of locomotion! To sweep along smoothly, gracefully, and swiftly over the tree tops, changing the course at pleasure, and alighting at will; how perfectly it would eclipse all other means of travel by land and sea! This magnificent problem, so alluring to the imagination and of the highest practical convenience and value, has been left heretofore to the dreams of a few visionaries and the feeble efforts of a few clumsy inventors. We, ourselves, have thought that, in the present state of human knowledge, it contained no promise of success. But, considering the greatness of the prize and the trifling character of the endeavors which have been put forth to obtain it, would it not indeed be well, as our correspondents suggest, to make a new and combined effort to realize it, under all the light and power of modern science and mechanism?

What little attention this subject has heretofore received from inventors has been almost wholly confined to two directions—flying by muscular power and the guidance of balloons. Both of these we have been accustomed to regard as impracticable. But, as Mr. Hyatt suggests, the flying by muscular power is a field of invention which has by no means been thoroughly explored. Though it may be impossible for a man to raise his own weight rapidly by beating the air, the *sustaining* of his weight in the air and moving horizontally is an entirely different problem. In the bird, the wings are moved by the most powerful muscles in the system. Has this hint been acted upon, and the muscles of the legs and shoulders been brought to bear upon the wings in the most efficient manner? Again: has the constancy of the rotary motion been made available in a flying machine? If spiral fans were used, of course, two sets would be required to prevent the machine from turning itself in the direction opposite to the motion of the fans.





But the thing that is really wanted is a machine driven by some natural power, so that the flyer may ride at his ease. For this purpose, we must have a new gas, electric, or chemical engine. What we require are two or more substances, solid or liquid, which, by merely being brought in contact, would be converted into gas. Place these in the re-action or Avery engine, which, by running at high velocity, would yield a large power in proportion to its weight, and it is possible—yes, probable—that the machine would drive spiral fans with sufficient force to raise itself from the ground. Would not the binoxyd of hydrogen and charcoal fill these conditions? This engine would run with such immense velocity that the fans would have to be very small; and it is probable that a moderate widening of the arms themselves—giving them a spiral inclination—would be the true plan. There might be two generating vessels, corresponding to the steam boiler; and when one was exhausted, the second might be brought into action while the supply of material was renewed in the first, thus supplying and exhausting them alternately.

The simplest, however, of all conceivable flying machines would be a cylinder blowing out gas in the rear, and driving itself along on the principle of the rocket. Carbonic acid may be liquefied, and, at a temperature of 150°, it exerts a pressure of 1,496 lbs. to the square inch. If, consequently, a cylinder were filled with this liquid, and an opening an inch square made in the lower end, the cylinder would be driven upward with a force equal to 1,496 lbs., which would carry a man, with a surplus of some 350 lbs. for the weight of the machine.

We might add several other hints to inventors who desire to enter on this enticing field; but we will conclude with only one more. The newly-discovered metal aluminum, from its extraordinary combination of lightness and strength, is the proper material for flying machines.

Flying Machines: A Bird-Woman

Messrs. Editors: I have seen in your paper an offer of $1,000, from Mr. Hyatt, for the best flying machine; and also (on page116 of the present volume) a letter asking for communications on the subject, and I thought I would write to you what I know about it. Six years ago, a friend (a Spaniard) told me that

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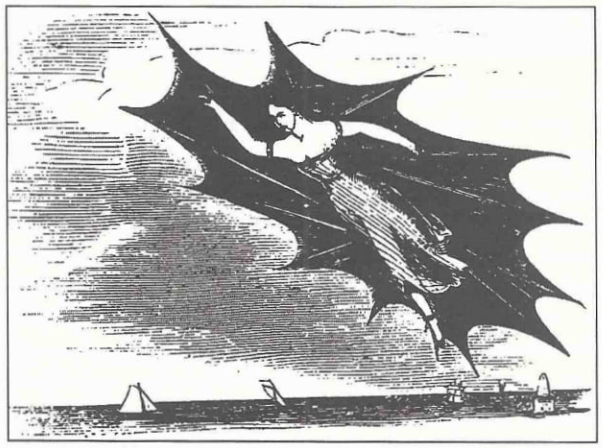


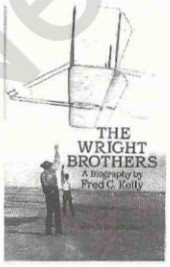
he had once witnessed or read an account of (I don't remember which) the trial of an apparatus for flying through the air. This apparatus was made by an old philosopher, and the experiment was made by his daughter above the bay of Barcelona (Spain); there being numerous boats on the waters of the bay, in case of accident. The experiment was perfectly successful; the young lady circled round and round for many miles, imitating most of the motions of the birds, and landed safely upon the shore. Unfortunately, however, the scientific world was never made aware of this successful experiment in aerial navigation, for the apparatus of the "bird-woman" was ruthlessly seized by the police as soon as she touched *terra-firma*; the authorities considering that her "machine" would be dangerous if made public, and used for unlawful purposes. This happened about ten years ago. All that "leaked out" in reference to the shape of the apparatus was that it looked something like a bat on the wing, and was made of varnished silk, with some mechanism (to give and direct its motion) operated by the feet and hands of the fair aeronaut.

If Mr. Hyatt or other persons are anxious to learn anything further about this machine, perhaps they can obtain information from the above source.

E.M.
Boston, Massachusetts
August 25, 1860

[We suppose that the "source" of information to which our correspondent refers is the Barcelona police who seized the flying maid. We imagine that Hyatt would have a "good time" in trying to find out about a matter which seems to have frightened the authorities of Barcelona out of their common sense. However, we give the statement for what it is worth; and if this letter of our correspondent should meet the eye of any member of the police of the above-named city, who was cognizant of the facts above narrated, he will oblige us by communicating the same.—Eds. 1860]

The Wright Brothers: A Biography



Fred C. Kelly, 1989 (reprint).
Paperback, 368 pp. Includes reprint of Jed Rothwell's "The Wright Brothers and Cold Fusion" article from Infinite Energy.
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20. Zemansky, M. and Dittmann, R. 1981. *Heat and Thermodynamics,* McGraw-Hill Book Co.
21. Pitzer, K. 1939. *J. Chem. Phys,* 7, 583. Phys.,
22. Gosman, L.A., McCarty, R.D., and Hust, J.G.1969.*Thermodynamic Properties of Argon from the Triple Point to 300°K at Pressures to 1000 atm,* 150, National Standard Reference Data Series, NBS-27.
23. Strobridge, T.R. 1962. *The Thermodynamic Properties of Nitrogen from 64 to 300°K between 0.1 and 200 Atmospheres,* NBS Tech. Note, 129.
24. Benedict, M., Webb, G.B., and Rubin L.C. 1940. "An Empirical Equation for Thermodynamic Properties of Light Hydrocarbons and Their Mixtures," *J. Chem. Phys.,* 8, 334-345.
25. Hust, J. and Gosman, A.L. 1964. "Functions for the Calculation of Entropy, Entalpy, and Internal Energy for Real Fluids Using Equation of State and Specific Heats," *Advances in Cryogenic Engineering,* 9, 227-233.
26. Walker, P.A. 1956. *The Equation of State and the Specific Heat of Liquid Argon,* University of London, Ph.D. Thesis.
27. Rabinovich, V.A., Vasserman, A.A., Nedostup, V.I., and Veksler, L.S. 1988. *Thermophysical Properties of Neon, Argon, Kripton, and Xenon,* National Standard Reference Data Service of the USSR, English version by Theodore B. Selover Jr., Hemisphere Publication Co.
29. National Institute of Standards and Technology, Gaithersburg, MD 20899, (formerly National Bureau of Standards), *Standard Reference Database 12 - Interactive FORTRAN Program to Calculate Thermophysical Properties of Fluids MIPROPS,* 1986.
30. Sato, H., Uematsu, M., Watanabe, K., Saul, A., and Wagner, W. 1988. "New International Skeleton Tables for the Thermodynamic Properties of Ordinary Water Substance," *J. Phys. Chem* Ref. Data, 17, 4, 1439-1539.
31. Hollinger, H. and Zenzen, M.J. 1985. *The Nature of Irreversibility,* D. Reidel Publishing Co.
33. Ostwald, W. 1924. *L'Energie,* Paris, Librairie Felix Alcan.
34. Yelin, X. 1988. *A Trial and Study on Obtaining Energy from a Single Heat Reservoir at Ambient Temperature,* Science Press, Beijing, China.
35. Capra, F. 1975. *The Tao of Physics,* Il Tao della Fisica, Adelphi, Milano (1982).
36. Born, M. Atomic Physics, London, Blackie & Son Limited.
37. Harvey, S., Leff, G., and Jones, L. 1974. "Irreversibility, Entropy Production, and Thermal Efficiency," *Am. J. of Physics,* 43, 11, 973-980.
38. Machlup, S. 1975. "Negative Temperatures and Negative Dissipation," Am. J. of Physics, 43, 11, 991-995.
39. Purcell, E.M. and Pound, R.V. 1951. Phys. Rev., 81, 279.
41. Atkins, P.W. 1984. *The Second Law,* Scientific American Book Inc., New York.
42. Guggenheim, E.A. 1945. "The Principle of Corresponding States," *J. Chem. Phys.,* 13, 7, 253-261.
43. Hill, P.G.A. 1990. "Unified Fundamental Equation for the Thermodynamic Properties of H_20," *J. Phys. Chem* Ref. Data, 19, 5, 1233-1274.
44. Heiting, A. 1971. Intuitionism an Introduction, North Holland Publishing Co., Amsterdam.
45. McCarty, R.D. 1970. *Provisional Thermodynamic Functions for Helium-4 for Temperatures from 2 to 1500°K with Pressures to 100 Mn/m^2 (1000 Atmospheres*), NBS Report 9762.
45. McCarty, R.D. 1972. *Thermophysical Properties of Helium-4 from 2 to 1500°K with Pressures to 1000 Atmospheres,* NBS-TN-631.
46. Younglove, B.A. and Ely, J.F. 1987. "Thermophysical Properties of Fluids: Methane, Ethane, Propane, Isobutane, and Normal Butane," *J. Phys. Chem* Ref. Data, 16, 4, 577-798.
53. Jacobsen, R.T., Stewart, R.B., and Jahangiri, M. 1986. "Thermodynamic Properties of Nitrogen from the Free Line to 2000°K at Pressures to 1000 MPa," *J. Phys. Chem.* Ref. Data, 15, 2, 736-909.
54. Haar, L. and Gallagher, J.S. 1978. "Thermodynamic Properties of Ammonia," *J. Phys. Chem.* Ref. Data, 7, 3, 635-972.
55. McCarty, R.D. 1986. "Thermodynamic Properties of Ethylene from the Freezing Line to 450°K at Pressures to 260 MPa," *J. Phys. Chem.* Ref. Data, 15, 2 ,593-734.
56. Walker, G. 1973. *Stirling-cycle Machines,* Clarendon Press, Oxford.
57. Tobin, M.C. 1969. *Am. Journ. Phys.,* 37, 1115. ❑❑❑

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field, we considered it important to have an outside laboratory perform surface analysis of the second copper target that had undergone prolonged ultrasonic activation. We employed Geller MicroAnalytical Laboratory of Topsfield, Massachusetts. Using a JEOL SEM with Auger Electron Spectroscopy (AES) Microprobe, one of the pitted regions of the copper target was examined. About twenty of these regions surrounded the central perforation of the Cu target at a radial distance of about 1 cm.

Figure 1 at 45X shows the strange eroded canyon-like features (note the imprinted scale) on the copper. Figure 2 is at 750x and the imposed rectangular area bracketing the magnified "promontory" indicates the region that was examined for unusual elements by the Auger electron beam. Figure 3, also at 750X, is of a nearby "smooth," unaffected Cu surface, very much different than the activated region.

Using the element analysis feature, the Auger electron spectrum was obtained for both the smooth and affected Cu surfaces. Only copper emission lines were seen with a very low aluminum peak present in both the smooth surface region (Figure 4) and in two areas of the activated surface (see Figures 5 and 6). There was no evidence of any unusual elements present. Bear in mind that convincing excess heat was not measured in the ultrasonic exposures of the copper foil.

❑❑❑

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Dash, Karabut, Romodanov) and the occurrence of nuclear products, such as helium, tritium, and charged particles (Goryachev, Romodanov, Miles), gamma-quanta (Dash, Baranov, Zelenski, Karabut), as well as new isotopes and elements not present in the initial samples (Chernov, Dash, Zelenski, Karabut, Savvatimova).

Nosov presented a review report on implementing acoustic stimulation of the phenomena of cold nuclear fusion. Kholodov reported on the theoretical interpretation of Urutskoev's experimental results; he had observed changes in the chemical composition of elements under conditions of hydraulically driven hammering.

Stimulating great interest was Bazhutov's report on his continuing experimental observation of a new heavy particle (erzion) in cosmic rays using three new installations; it is possible that this particle catalyzes the nuclear transmutation of chemical elements.

Sallin presented a report on the continuation of his investigations in loading metals with hydrogen. It is worthwhile noting that the magnitude of binding energy of hydrogen (deuterium) atoms is about 30 eV/atom. A short report by academicians Korovyakov and Fomenski concerned interpretations of some of the problems of modern physics. The theoretical works presented (Rodionov, Churkin, Frisone, Kholodov, Shadrin) have demonstrated widening and deepening understanding of likely mechanisms of the phenomena of cold fusion and nuclear transmutation.

RCCNT-9 will most likely be held in the fall of 2001.

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what they termed "biological transmutation of potassium." In fact, Baranger never claimed to have discovered a "transmutation of elements" phenomenon; moreover, the experts did not use the same protocols as Baranger and did not present detailed reports of their own experiments. In the end, Baranger's manuscript was presented at the Academy of Agriculture by Prof. J. Guilhon, but only five years after Baranger's death and during "in camera" session. The history of this has been summarized by Agriculture General Inspector J.M. Gatheron, who collected and edited a number of original reports which were privately published in a booklet by the family of Prof. Baranger in 1977.

In recent times, Prof H. Komaki, an applied microbiologist at the University of Mukogawa, appears to have found anomalous variations of potassium and phosphorous levels during the growth of some thirty different strains of microorganism, depending on the initial composition of the growth medium.

One might speculate on some kind of tunneling effect operating to overcome the barrier between atomic nuclei, but at this time it is difficult to say whether the results of von Herzeele and Baranger actually provide evidence for any type of biologically-directed transmutation. Clearly Kervran's arguments were not convincing to scientists, even though he achieved some popular fame for the concept. Indeed the difference between a valid scientific theory and a compilation of unsubstantiated assertions is not fully appreciated by the general public.

Part of the problem may lie with the peer-review system by anonymous referees. Within the mainstream sciences it often serves to suppress evidence to the point that researchers are totally unaware of apparent anomalies, which makes it impossible to resolve such matters, while outside the mainstream sciences there is no system in place at all to check the veracity of such claims. A more constructive refereeing system is clearly desirable. The role of SSE and *JSE* are important in this regard.

Thanks are due to Philippe Desbrosses for kindly making valuable documents available.

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References

Anonymous. 1972. "La Rouge et al Jaune," *Revue de la Société amicale des anciens de l'École Polytechnique* (AX), N. 271, June.

Baranger, P. 1957. "Mémoire sur l'étude du métabolisme de P, K, et Ca chez *Vica sativa*," *Conférence à la Section de Poitiers de la Société française de Chimie*, publ. 7 Mars 1964, p. 3.

Baranger, P. 1958. *Conférence Polytechnicienne*, Paris, December 2.

Baranger, P. 1959. *Conférence à l'Institut National Genevois*, Genève, January 27.

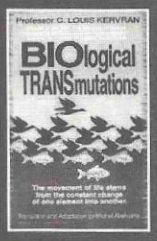
Baranger, P. 1960. *Journal of Biological Sciences*, Bombay, 3, 2, 57-85.

Baranger, P. 1960. "Variations en K et P des graines de *Vicia sativa* en presence de calcaire," *Bulletin du Muséum d'Histoire Naturelle*, No. 1.

Baranger, P. 1961. *Proc. Symp. on Phytochemistry*, Hong Kong, pp. 10-12.

Baranger, P. 1958. "Contribution à l'étude du métabolisme du phosphore, du potassium et du calcium," chez les vesces de Cerdagne, Manuscrit soumis à l'Académie des Sciences, May 28, Dépôt sous pli cacheté en 1971.

References continue on page 70.



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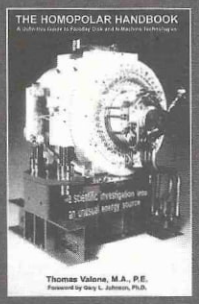

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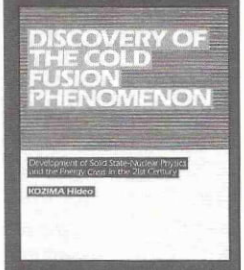

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Baranger, P. 1976. "Les plantes opèrent-elles des transmutations?" *Académie d'Agriculture*, Séance à huis clos du 10 Mars 1976 sous la présidence de M. Audibier.

Cavé, B. 1957. Interprétation statistique. Expériences de 1956 sur les vesces de Cerdagne (variations de P et K), Rapport du January 16, Paris.

Desbrosses, Ph. 1988. *Le Krach Alimentair*, Éditions du Rocher, Paris, p. 121.

Epstein, M. 1992. "The Skeptical Perspective," *Journal of Scientific Exploration*, 6, 307-310.

Gatheron, J.M. 1977. Une illusion ou un bond prodigieux de la sciences? Les plantes opérent-elles des transmutations? *Les travaux de Pierre Baranger*, edition par la famille Baranger.

Herzeele, A. Von (1876-1885). *Verlag von Herman Peters*, Mohrenstrass, 28, Berlin.

Kervran, L.C. 1972. *Biological Transmutations*, New York: Swan House Publishing.

Komaki, H. *Journal of Applied Pathology*, Communicated by Gatheron.

Comments on Michel Bounais' Letter to the Editor

The letter by Michel Bounias regarding "qualified scientific works" that support claims for "biological transmutation" brings up some concerns that I was unable to address in the limited space of my column "Skeptical Perspective." These concerns apply not only to this particular case, but to the general case of claims of anomalous events.

The age of the scientific "generalist" is over. Scientists today cannot possibly maintain expertise in the myriad of modern scientific disciplines. Nineteenth century scientists like Bunsen could be "state-of-the-art" and publish in a variety of areas, since the knowledge-base was of limited size. Today, it is difficult to remain current in a single speciality within a scientific discipline (*e.g.*, inorganic analysis in analytical chemistry). I use the latter example because that is the area in which I was trained and have worked for over twenty years. And this is precisely the area that applies to the work on inorganic metabolism in plants. Let me apply that knowledge to an examination of Baranger's experiments as described by Bounias.

Baranger's results hinge on his determination of K, P, and Ca using the analytical methods of photometry and direct flame spectrometry that were available in the 1950s. The claim that "levels of mineral traces that could be released from the reagents and apparatus, as well as other measurements were determined with a relative error of about 1/1000" is ridiculous. That level of precision is restricted to classical methods of analysis, such as titrimetry and gravimetry, and can only be approached today by sophisticated methods that employ internal standard ratio measurements. But measurement precision does not guarantee reliable analytical results. Measurements using both photometry and flame spectrometry suffer from significant biases that result from the effect of other elements on the measurement of the analyte. These interferences effect the "accuracy" of measurement and the magnitude of the interferences will vary depending on (a) the concentration of the interfering element and (b) the physical parameters of the measurement system. It is not unusual to see differences of more than 10% using exactly the same apparatus on different days, particularly when measuring calcium in the presence of phosphorus (a classic interference pair). In the 1950s, the instrumentation used to make those measurements was subject to numerous errors that were not understood at the time.

This is just the tip of the iceberg. Analytical techniques like photometry and flame spectrometry depend on comparisons of standards and samples. Accuracy of analysis depends critically on the correct and stable preparation and storage of standards. Even today, when interlaboratory comparisons are used in collaborative certification of reference materials, it is not unusual to see differences of "orders of magnitude" for some element concentrations obtained from different laboratories (and this in 1990, not 1960!).

So where does this leave us? Even though it is a well-worn phrase, extraordinary claims still require extraordinary proof. It is easy for those who are not familiar with the critical requirements of inorganic measurements to see an anomaly when none exists. Assessment of significant differences in data sets by statistical analysis of data assumes control of measurement bias, and that is something we have difficulty with even today.

Sure, there are still anomalies. In twenty years I have experienced more than my share. Some I was finally able to explain. . .others I have yet to understand. Nevertheless, those in other fields of science should be extremely cautious before accepting extraordinary claims without intimate knowledge and understanding of how they were measured. And that requirement for caution emphasizes the need for an organization like the SSE, which, unlike others that are willing to examine anomalies, can count on a broad range of scientific expertise within its membership to properly examine extraordinary claims.

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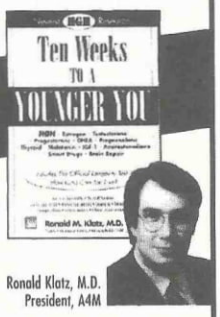

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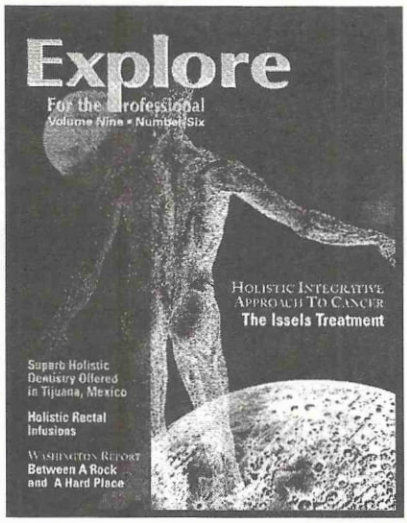

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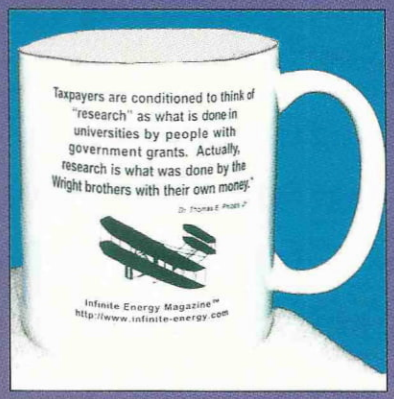

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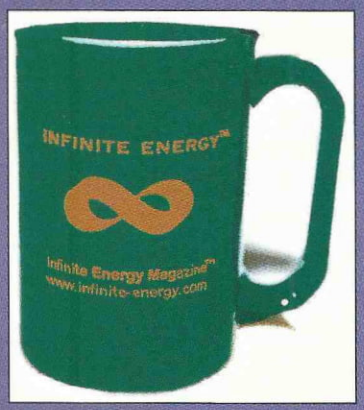

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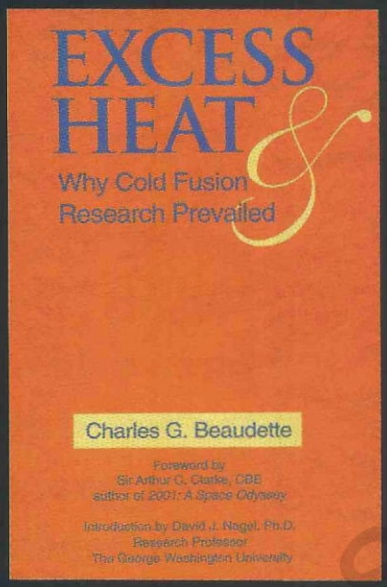

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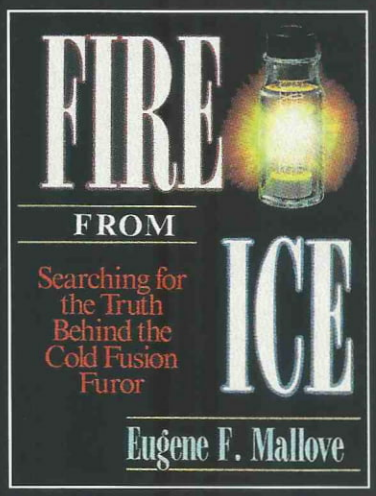

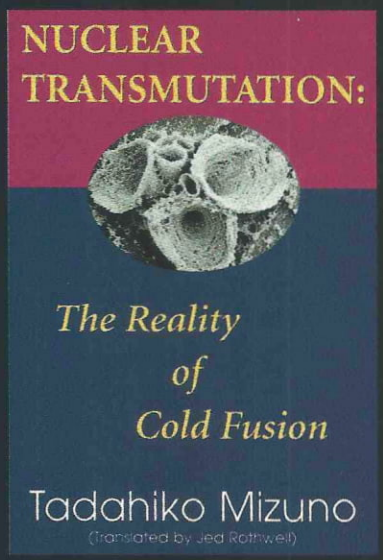

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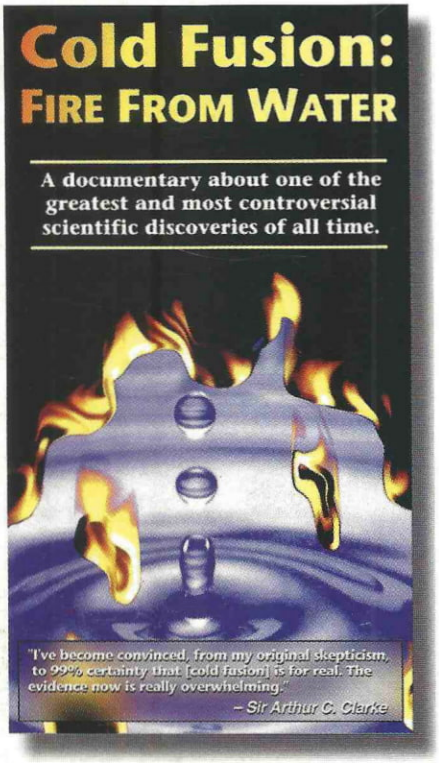

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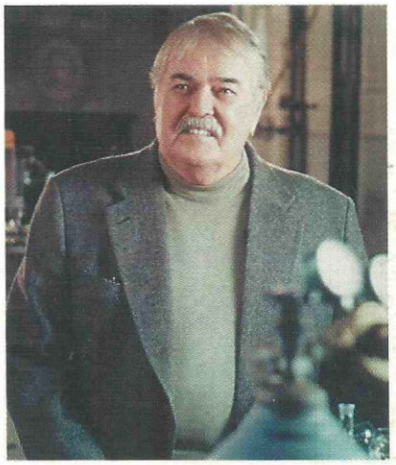

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